

Early Routes of Asian Influenza Spread

Urban Dental Expenditures

SELMA MUSHKIN and BEATRICE CROWTHER

Out-of-pocket dental expenditures of the urban population amounted to about \$10 per person in 1950. They accounted for about 15 cents of each \$1 of total out-of-pocket medical care expenditures. The average urban family spends about \$30 a year for dental care as compared with \$197 for all medical and health services.

Dental expenditures are highly concentrated. Almost half of the more than \$900 million spent on dental care by urban families in 1950 represents the spending of less than 5 percent of the city population. About 48 percent of urban families reported no dental outlays.

Dental expenses take a larger share of the medical care dollar at ages 6-18 years than at other ages. About 28 percent of all medical spending for children of these ages goes for dental care. In contrast, only 7 percent of the medical care expenditures of those 65 years or over goes for dentistry. Dental bills of \$100 or more, however, take a larger share of the dental dollar of the middle and older age groups.

DATA COLLECTED from families surveyed by the Bureau of Labor Statistics in its 1950 study of spending habits among city families provide a basis for analyzing some aspects of the dental expenditure patterns in urban areas, where dental resources and facilities are relatively more ample than they are in rural places (1). They provide information on the concentration of dental expenses, which other surveys have by and large neglected, but which may throw some light on the financial problem of prepayment of dental services.

The design and coverage of the Bureau of Labor Statistics survey were outlined in an earlier article (2). In summary, the Bureau of

Labor Statistics interviewers obtained complete and useful information on family income and spending habits for 12,489 families, including single-person consumer units.

As a basis for a study of medical care spending variations by age groups, the Public Health Service drew a random subsample of the Bureau of Labor Statistics schedules and tabulated the information reported by the families on expenditures of individual family members. In selecting the subsample the interview schedules were stratified by the amount of total medical care expenditures. The subsample included all schedules reporting expenditures of \$1,000 or more, 50 percent of those reporting \$400 to \$1,000, 20 percent of those reporting \$200 to \$400, and 10 percent of those reporting some medical care expenditures but in amounts less than \$200. To provide a basis for evaluating medical care received by public beneficiaries, such as public assistance recipients, 50 percent of the schedules reporting no medical care expenditures were also included in the subsample. A total of 2,414 consumer units composed of about 7,639 persons were included in the subsample.

Data on family expenditures are based on tabulations of 12,489 consumer units interviewed by the Bureau of Labor Statistics. Data on individual expenditures are based on the subsample of 2,414 consumer units.

Dental expenses reported in the survey represent out-of-pocket charges incurred by members of the family for the broad range of

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Table 1. Average out-of-pocket expenditures per family for dental care and for direct medical care, by income group, urban population, 1950

| Income group | Dental expenditures | | Total direct medical expenditures ¹ | |
|------------------------|---------------------|------------------------------|--|-------------------------------|
| | All families | Families with dental expense | All families | Families with medical expense |
| All income groups..... | ² \$30 | \$58 | \$163 | \$175 |
| Under \$1,000..... | 7 | 43 | 82 | 105 |
| \$1,000-\$1,999..... | 10 | 35 | 80 | 94 |
| \$2,000-\$2,999..... | 17 | 54 | 120 | 129 |
| \$3,000-\$3,999..... | 27 | 46 | 159 | 166 |
| \$4,000-\$4,999..... | 35 | 52 | 178 | 184 |
| \$5,000-\$5,999..... | 41 | 56 | 205 | 209 |
| \$6,000-\$7,499..... | 56 | 75 | 248 | 253 |
| \$7,500-\$9,999..... | 64 | 82 | 338 | 345 |
| \$10,000 and over..... | 96 | 116 | 390 | 394 |

¹ Excluding health insurance premiums but including dental expenditures.

² Averages adjusted to Bureau of Labor Statistics aggregate medical care expenditures per consumer unit and 91-city distribution of expenditures by class of service.

dental services, including dentures and dental X-rays. Drugs purchased on the prescription of a dentist are excluded from dental expenses.

Family Dental Expenses

Urban families in 1950 spent an average of about \$30 for dental care; excluding families who made no expenditure, the average was about \$58 (table 1). Converting the \$30 family average to a nationwide estimate of urban family dental spending yields a figure of some \$945 million, a figure which is high when compared with national income account estimates of personal consumption for dental care. This divergence between family survey estimates of aggregate dental care expenditures and the national income estimates of the Department of Commerce derived from income surveys of practitioners has been noted by others (3-5). Additional study is required to analyze these differences and determine the origin of the divergencies and the conceptual and reporting problems involved.

The data on urban family expenditures underscore the special characteristics of dental spending which mark it as different from other medical outlays. For one thing, a large proportion of consumers do not purchase dental care in a given year. In 1950 about 48 percent

of the urban families reported no expenses for dental care. In contrast, only 7 percent of the families reported no spending for direct health services, that is, spending for medical care exclusive of health insurance premiums (table 2).

Dental care spending by income groups varies more sharply than other medical care costs. Average family dental expenditures of the \$1,000 to \$2,000 income group, for example, are about one-tenth of the average dental expenditures of families with incomes of \$10,000

Table 2. Percentage of families reporting out-of-pocket expenditures for dental care and direct medical care, by income group, urban population, 1950

| Income group | Dental expenditures | Direct medical expenditures ¹ |
|------------------------|---------------------|--|
| All income groups..... | 52 | 93 |
| Under \$1,000..... | 16 | 78 |
| \$1,000-\$1,999..... | 28 | 85 |
| \$2,000-\$2,999..... | 31 | 93 |
| \$3,000-\$3,999..... | 59 | 96 |
| \$4,000-\$4,999..... | 66 | 97 |
| \$5,000-\$5,999..... | 73 | 98 |
| \$6,000-\$7,499..... | 76 | 98 |
| \$7,500-\$9,999..... | 78 | 98 |
| \$10,000 and over..... | 83 | 99 |

¹ Excluding health insurance premiums but including dental expenditures.

and over. Average expenditures for direct medical care of the \$1,000 to \$2,000 income group are about one-fifth of the average expenditures of families with incomes of at least \$10,000. This difference is attributable largely to the variation in the proportion of families in different income groups who use paid dental services. Almost 3 times as great a proportion of families with an income of \$10,000 or more report dental expenses as do families with an income of \$1,000 to \$2,000. There is little difference between the high and lower income groups in the proportion of families reporting some direct medical expenditures.

The average spent for all direct medical expenditures (that is, excluding insurance premiums) by families reporting some expenses is 4.2 times as high for families with an income of \$10,000 or more as for families with an income of \$1,000 to \$2,000. In contrast, average dental expense of the \$10,000 and over income family reporting some dental expenditures is only 3.3 times that of the \$1,000 to \$2,000 income family.

Within these averages there is considerable variation depending on the age of family members and family size, as well as other characteristics.

Age Differentials

The pattern of age differentials in dental spending for urban residents is similar to that obtained by the Health Information Foundation in its 1952-53 survey of both rural and urban families (6). Dental charges in the Health Information Foundation study averaged \$10 per person, with a high of \$14 per person 35-54 years of age and lows of \$4 per person 65 years of age or older and \$1 per person under 6 years of age. In the Public Health Service study, limited to urban residents, the high is \$13 for those 19-44 years of age, and the low is \$2 for children under 6 (table 3). The average expenditure for urban persons 65 and over in the Public Health Service study is \$6, compared with the Health Information Foundation average of \$4 in both urban and rural areas. (The percentage distributions by age group of the Public Health Service sample, of the urban population, and of dental expenditures are given in table 4.)

Table 3. Average out-of-pocket expenditures per person for dental care and for all medical care, by age group, urban population, 1950

| Age group (years) | Average dental expenditures | | Total medical expenditures ¹ |
|---------------------|-----------------------------|---------------------------------------|---|
| | Amount | Percent of total medical expenditures | |
| All age groups----- | ² \$10 | 15. 2 | ² \$65 |
| Under 6----- | 2 | 6. 1 | 20 |
| 6-18----- | 10 | 28. 5 | 35 |
| 19-44----- | 13 | 17. 4 | 72 |
| 45-64----- | 11 | 12. 1 | 93 |
| 65 and over----- | 6 | 7. 2 | 83 |

¹ Including health insurance premiums and dental expenditures.

² Averages adjusted to Bureau of Labor Statistics aggregate medical care expenditures per consumer unit and 91-city distribution of expenditures by class.

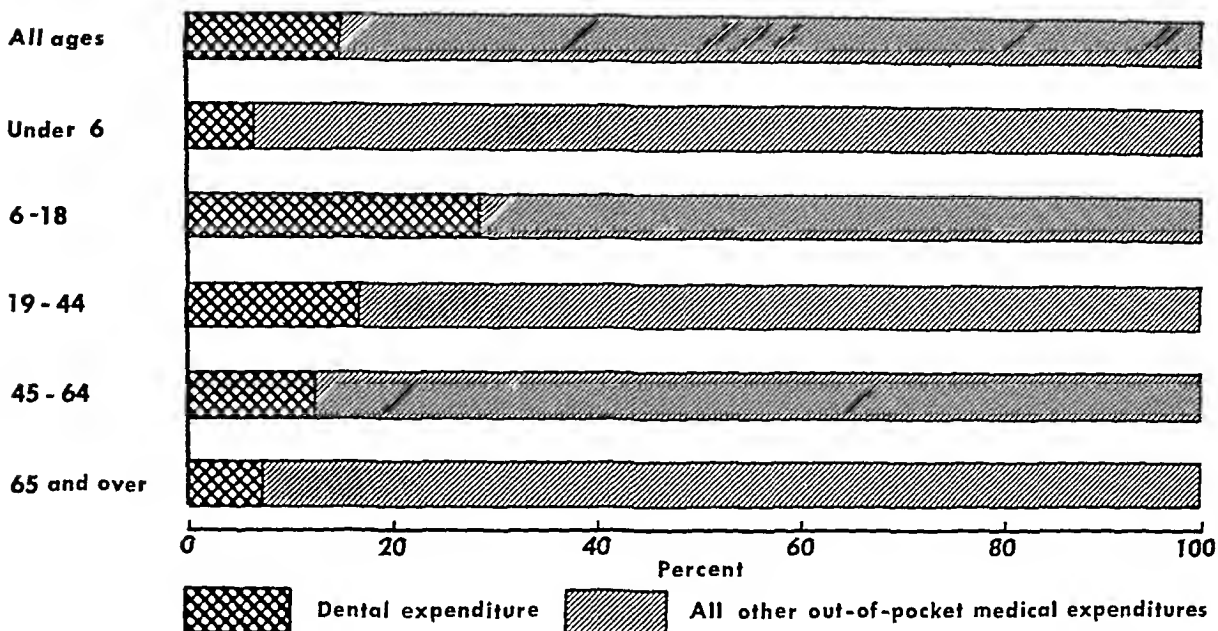
While dental expenses account for 15 percent of total medical care expenditures of all urban residents, they account for 28.5 percent of the total medical spending for those 6-18 years of age (fig. 1). Dental expenses account for about 7 percent of total medical spending of persons 65 and over and for only 3 percent of expenditures of those 75 and over.

These averages reflect the appreciable proportion of persons in each age group who had no dental expenses during the year. Almost 70 percent of urban residents of all ages incurred no dental expenses. Excluding children under

Table 4. Percentage distribution of urban population and urban out-of-pocket dental expenditures, by age group, 1950

| Age group (years) | Percent of urban population | | Percent of dental expenditures |
|---------------------|-----------------------------|------------------|--------------------------------|
| | In sample | In United States | |
| All age groups----- | 100. 0 | 100. 0 | 100. 0 |
| Under 6----- | 12. 7 | 11. 9 | 2. 3 |
| 6-18----- | 19. 1 | 17. 6 | 19. 3 |
| 19-44----- | 38. 3 | 41. 1 | 48. 8 |
| 45-64----- | 21. 3 | 21. 3 | 24. 3 |
| 65 and over----- | 8. 6 | 8. 1 | 5. 3 |

Figure 1. Dental expenditures as percentage of total out-of-pocket medical care expenditures, by age group, 1950.



6 years because dental services are usually not initiated until the child reaches 3 or 4 years of age (7), the proportion of persons reporting no dental expenses increases from 60 percent for those 6 through 44 years of age to 87 percent at ages 65 years and over (table 5).

Concentration in Expenses

Not only is the proportion of families purchasing dental services substantially higher in the upper income groups but a large part of all dental expenditures is accounted for by the

spending of a small part of the population. For all age groups combined almost half of the dental expenditures are made by individuals spending \$50 or more a year for dental care. The concentration of expenses differs considerably by age: In the 6-18 age group only 30 percent of dental expenses are in amounts of \$50 or more, and in the 45-64 age group almost two-thirds of the expenses are above \$50 per year (table 6).

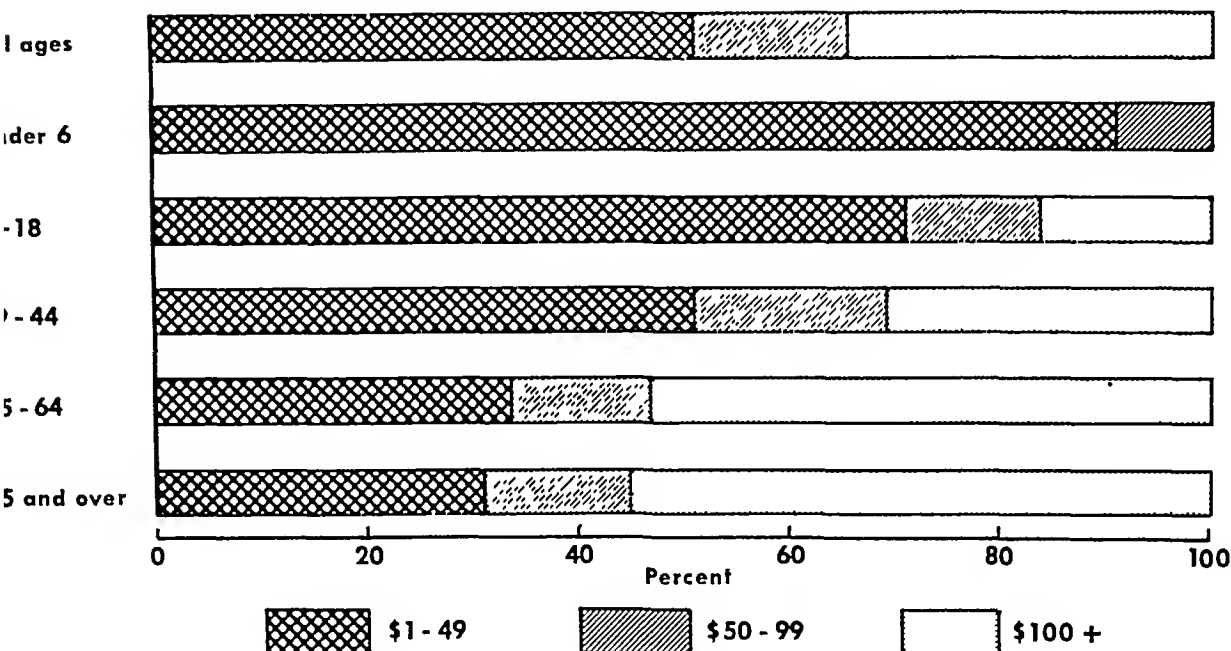
Although a smaller proportion of the urban population in the upper age groups incurred dental charges, a large part of their dental bills

Table 5. Percentage distribution of persons in each age group by amount of out-of-pocket dental expenditures, urban population, 1950

| Dental expenditures | Age group (years) | | | | | |
|---------------------|-------------------|---------|-------|-------|-------|-------------|
| | All ages | Under 6 | 6-18 | 19-44 | 45-64 | 65 and over |
| Total..... | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| None..... | 69.5 | 91.4 | 60.4 | 60.5 | 73.8 | 86.7 |
| \$1-\$49..... | 25.7 | 8.3 | 36.4 | 33.0 | 19.7 | 9.6 |
| \$50-\$99..... | 2.6 | (0.3) | 2.4 | 3.9 | 2.5 | 1.4 |
| \$100-\$199..... | 1.6 | 0 | .5 | 1.8 | 3.0 | 1.8 |
| \$200 and over..... | .6 | 0 | .3 | .8 | 1.0 | .5 |

NOTE: Figures are shown in parentheses when the product of the percentages and the unweighted count of persons in the sample in the given age group is less than 10.

Figure 2. Percentage distribution of dental expenditures by size of expenditure and age group, 1950.



was made up of annual bills of \$100 or more or even \$200 or more (fig. 2). About 1 percent of children 6-18 years of age incurred dental charges of \$100 or more, and the charges in these amounts accounted for 16 percent of the total dental spending for this age group. By way of comparison, about 4 percent of persons 45-64 years of age incurred annual dental charges of \$100 or more, but their bills represented more than \$1 out of each \$2 of the total dental spending of urban residents of those ages. Their charges of \$200 or more represent

more than \$1 out of each \$5 spent by those 45-64 years of age.

Differences in spending patterns reflect in part differences in the nature of dental care needs associated with age. The large dental bills are of lesser importance in dental spending for children under 19 years of age than in dental spending of the middle or upper ages. More than 90 percent of the dental expenses for children under 6 years and about 70 percent of the dental expenses for children 6-18 years are in amounts less than \$50; only 10 percent of the

Table 6. Percentage distribution of out-of-pocket dental expenditures of each age group by amount of expenditures, urban population, 1950

| Dental expenditures | Age group (years) | | | | | |
|---------------------|-------------------|---------|-------|-------|-------|-------------|
| | All ages | Under 6 | 6-18 | 19-44 | 45-64 | 65 and over |
| Total..... | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| \$1-\$49..... | 50.6 | 91.2 | 70.9 | 51.0 | 34.1 | 30.9 |
| \$50-\$99..... | 15.5 | (8.8) | 13.2 | 18.3 | 12.8 | 13.8 |
| \$100-\$199..... | 18.7 | 0 | 5.9 | 16.6 | 31.2 | 34.9 |
| \$200 and over..... | 15.2 | 0 | 10.0 | 14.1 | 21.9 | 20.4 |

Note: Figures are shown in parentheses when the product of the percentages and the unweighted count of persons in the sample in the given age group is less than 10.

charges for those 6-18 are in amounts of \$200 or more. Preventive dentistry at preschool ages may help to reduce that part of these expenses attributable to dental neglect.

Trends in Spending

Estimates of dental expenditures published each year by the Office of Business Economics of the Department of Commerce indicate that the share of total medical care spending represented by dental expense has decreased (8, 9). In 1929 dental expenses represented 16 percent of personal medical care expenditures; in 1950, 10 percent; and in 1956 (the latest year for which data are currently available), about 9 percent. Household survey data similarly indicate some but not as marked a decline in the share of medical spending going for dental services. This decline is attributable in part at least to the reduced dentist-population ratio.

In the survey data of the Committee on the Costs of Medical Care for 1928-31, dental care represented about 18 percent of total private medical spending. The Health Information Foundation survey indicates that about 16 percent of gross medical charges went for dental services in 1952-53. The Bureau of Labor Statistics data indicate that 15 percent of out-of-pocket medical expenses of urban consumers went for dentistry in 1950.

Dental spending per person increased during the 20-year period from \$6.41 for cities of 5,000 and over population in 1928-31 (10a) to \$10 for urban areas in 1950. However, medical expenses per person increased more. In 1928-31 the city average per person was \$30.90 (10b); in 1950 the city resident average was almost \$65. (These figures are in current dollars for the year in which they were reported.)

It is not surprising in view of the increased complexity of medical care, the number of new types of professional and paramedical skills comprising the "medical care package," and the spread of prepayment coverage that dental expenditures have declined somewhat in relation to total medical spending.

Utilization of dental services has increased somewhat. In 1928-31, 74.4 percent of persons in cities of 100,000 or more population and 78.5 percent of persons in cities with populations of

5,000 to 100,000 incurred no expenses for dental care (10c). In 1950, 69 percent of urban residents reported no dental expenses. This is remarkably little improvement in utilization when account is taken of the typical pattern of dental spending in relation to income and the rise in average family income since the survey of the Committee on the Costs of Medical Care. (Factors other than income—education and social status, in particular—influence utilization of dental services, but this study provided information only on the relation to income.) Typically, dental spending, both in the percentage of persons incurring dental expenses and the average amount of expenses, rises with family income. Why has the rise in income levels and improved distribution of income among families not been reflected in a more substantial improvement in use of dental services? Similarly, why has the increased urbanization of the population not resulted in substantially increased dental care? Part of the problem may lie in the lack of comparability of the survey data and in the inadequacies of family reporting in the medical expenditure surveys. In part it may be attributed to the decline in the ratio of dentists to population.

The National Health Survey now under way will provide data for evaluating utilization of dental services among the general population in both rural and urban areas. This survey, moreover, will provide data on the types of dental services used by different groups in the population.

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films

Laboratory Diagnosis of Ringworm In Animals

I. *Microsporum* Infections II. *Trichophyton* Infections

35-mm. filmstrip, color, sound, 8 minutes, 47 frames and 12 minutes, 60 frames, respectively, 1957.

Audience: Veterinarians, physicians, and mycological laboratory technicians.

the two important species *canis* and *gypseum* and of *Trichophyton*, *mentagrophytes*, *equinum*, *verrucosum*, and *gallinae*.

The mode of transmission of infections from animal to man and the appearance of the infections in man are illustrated.

These films are available on short-term LOAN from the Communicable Disease Center, Public Health Service, 50 7th Street NE., Atlanta 5, Ga., and by PURCHASE from United World Films, Inc., 1445 Park Avenue, New York 29, N. Y.

D. C., and by PURCHASE (\$60 per print) from the Communicable Disease Center, Public Health Service, 50 7th Street NE., Atlanta 5, Ga.

Child Care Problems of Physically Handicapped Mothers

16-mm. film, color, sound, 30 minutes, 1957.

Audience: Professional personnel and lay people interested in problems of the handicapped mother.

The film, made in 8 different homes, shows the problems of 1 normal mother, 3 wheelchair mothers, 1 amputee mother, 1 mother with muscular weakness, 1 using a crutch, and 1 with a leg brace. It points up the need for expanding programs to include more of the 10 million handicapped homemakers in the United States.

It was produced by the School of Economics, University of Connecticut, in cooperation with the Connecticut Team Approach Committee on Research Demonstrations and Workshops Concerning Physically Handicapped Women, and the Office of Rehabilitation, Department of Health, Education, and Welfare.

Address inquiries on borrowing and purchase to Audio Visual Center, University of Connecticut, Storrs, Conn.

"Anyone for Nursing?"

16-mm. filmograph, color, sound, 17 minutes, 1957.

Audience: Schools of nursing, nursing organizations, and high school career guidance groups.

This filmograph covers in detail nursing activities and opportunities in Public Health Service hospitals, in the Indian and international health programs, in research nursing at the National Institutes of Health, and public health nursing programs generally.

The story is presented in a light, gay manner throughout, with an occasional cartoon and simple animation.

This film is available on short-term LOAN from the Recruitment Branch of the Division of Personnel, Public Health Service, Washington 25,



Microsporum gypseum macroconidia.

The clinical features of *Microsporum* and *Trichophyton* ringworm in animals are described, followed by demonstrations of methods for examining the animals with the Wood's light and for collecting specimens for laboratory study.

The laboratory methods consist of examining the clinical materials, inoculating culture media, and in case of *Microsporum* identification of

Dental Services for Special Groups

CONFERENCE REPORT

DENTAL CARE services for the indigent, the mentally retarded, public assistance recipients, and other population groups were discussed by dental directors attending the Biennial Conference of State and Territorial Dental Directors with the Public Health Service and the Children's Bureau held in Washington, D. C., June 19-21, 1957.

Dental directors attending the conference were welcomed by Katherine B. Oettinger, chief of the Children's Bureau, and Dr. Leroy E. Burney, Surgeon General of the Public Health Service. In a following address Dr. John W. Knutson, chief dental officer of the Service, urged increased emphasis on the promotion of fluoridation. He also pointed out that the changing trend in public health from infectious diseases to long-term illnesses will require close cooperation of the medical and dental professions to achieve new public health goals.

One of the sessions of the conference was devoted to a series of table clinics on dental statistics, dental hygiene, traineeships, Hill-Burton dental facilities, fluoridation and defluoridation, group payment plans, public assistance, and research grants. Summaries of the other discussions follow.

Local Dental Clinics

Local dentists provide the technical skills and local health officers set the policies for local health clinics in Georgia, according to Dr. John E. Chrietzberg, director of dental health service, Georgia Department of Public Health. In

addition, consultants from local, regional, and State health departments take part in organizing and operating the clinics.

One of the first steps taken by the department of health in developing a clinic is to ask the community to set up an advisory committee. This committee is made up of several dentists, school people, representatives from the welfare department, public health personnel, and representatives from the PTA, service clubs, and other groups with specific interests in a service program.

Chrietzberg said that the committee is asked to establish a means test, which is not done at the State level. The State health department generally advises the committee and provides it with the methods that are being used in other communities. Committee members help raise local funds for transporting youngsters and maintaining the clinic. They also help to buy supplies. "All this makes the community feel it is their clinic," he said, "and consequently, the clinics are effective and most likely permanent."

Of the 45,932 children admitted to the 116 clinics in Georgia, 16,000 received complete treatment; 29,932 received only partial treatment, but many of these received total treatment of permanent teeth. The total cost of the program was \$69,745.

Payments by the clinic are modest, the dentist receiving \$5 and the assistant \$1 an hour. In Chrietzberg's opinion, the experience might well prove helpful some day in planning prepayment dental plans on a maintenance pro-

gram. The clinical program has also encouraged many dentists to do more dental work for children.

Indigent Care in Maryland

Private dental office treatment for indigents provided by the Maryland medical care program was described by Dr. Edward Davens, deputy director of public health, Maryland State Health Department. Presumably programs of this kind can be developed in nearly all States, he said, citing the amendment of the Social Security Act of last year which will provide medical and dental funds to States for four categories of public assistance: old-age assistance, aid to the permanently and totally disabled, aid to dependent children, and aid to the blind. In most States the funds will be administered by welfare departments.

In the cleft-palate program, the clinic approach is integrated because the problem is not limited to cosmetic or plastic surgery, but involves communication and dental as well as medical and audiological problems. The program is operated jointly by the State health department, the Johns Hopkins University School of Medicine, and the University of Maryland Dental School.

Davens concluded with the hope that there would be a continuing emphasis on the fluoridation of public water supplies in Maryland. "Today," he said, "85 percent of our people who use central water supplies drink fluoridated water."

The Mentally Retarded

In Pennsylvania, if an agency bears the cost of providing dental treatment to mentally retarded and cerebral palsied children who are indigent or if the dentist gives free treatment to such patients, the State health department will pay for hospitalization of patients requiring general anesthesia or special techniques applicable only in a hospital. According to Dr. Linwood G. Grace, director, division of dental health, Pennsylvania Department of Health, who described the program, very few dentists would accept mentally retarded and cerebral palsied children at the outset. There was a great need to improve the dentist's knowledge of the necessary technique.

With the cooperation of the University of Pennsylvania in Philadelphia and the University of Pittsburgh, three training courses were conducted to teach practicing dentists the required special techniques. The courses were highly successful, he said, and will probably be repeated as the program grows.

Children's Bureau Program

The \$1 million earmarked by Congress for special projects and services for mentally retarded children in fiscal year 1957-58 is being used by the Children's Bureau for demonstrations or pilot programs in 24 States, reported Dr. Arthur J. Lesser, director, Division of Health Services, Children's Bureau. These programs, while providing clinical services, emphasize treatment of the more severely retarded and younger children. The medical or clinical components are basic, but a team approach integrates the services of a physician, social worker, and psychologist.

"Only 10 percent of retarded children are in institutions," Lesser said. "Most parents want to keep their children at home, but they need help if they are going to do a good job."

In 1955, some 278,000 children received services from physicians under this program. About half of these children have an orthopedic handicap, and the rest have various conditions such as heart disease, cleft palate, epilepsy, and cerebral palsy. The increase in the numbers of children in this program since about 1940 has been largely in the nonorthopedic groups.

Lesser explained that treatment of the crippled child has moved away from the almost exclusively orthopedic and plastic surgery programs to one which is becoming a pediatric program for children with long-term illnesses or physically handicapped conditions.

A considerable amount of program funds goes into training of all sorts: dentistry, maternity care, public health, audiology, and so on.

Public Assistance Programs

Discussing dental care for public assistance recipients, Dr. Thomas B. McKneely, medical consultant, Bureau of Public Assistance, Social Security Administration, outlined the four categories of "needy" persons covered by Fed-

eral aid to States: persons 65 years of age and older; persons who are blind; dependent children; and persons who are permanently and totally disabled.

These four groups in January 1957 included more than 5 million individuals who received assistance amounting to over \$227 million.

The primary purpose of public assistance, he said, is to help needy people secure the basic necessities for living, such as food, shelter, clothing, and other items. The Bureau of Public Assistance has long recognized medical care as one of the basic necessities, and Federal matching funds within the maximum have been available to the States.

Before 1950, matching money was available only for unrestricted payments to the recipients. Amendments to the law in 1950 permitted Federal sharing in payments made directly to vendors of medical services. The 1956 amendments established a separate matching formula for medical expenditures. This formula makes available to States a monthly amount not in excess of one-half of \$6 times the adult recipients in each category and \$3 times each child included in the aid to dependent children category. Money under this formula is granted to States on the basis of the amount expended each month. Each category is a separate program with separate fiscal accounting. Thus, funds expended in one are not transferable to another category.

Dental care comes within the broad definition of medical care. A 1946 study of medical care in public assistance showed that out of each dollar spent, dental care accounted for 3 cents in the old-age assistance category; 12 cents for aid to dependent children; and 9 cents for aid to the blind. The proportion of the caseload receiving dental care during the 1946 study period by category was, respectively, 1.4 percent, 4.8 percent, 2.5 percent. There was no program for aid to the permanently and totally disabled. Although the figures are old, McKneely said, they do show there was some dental care in the program and that there was recognition of the greater need among children for dental care.

The Bureau of Public Assistance, he continued, does not require a State to include medical care in its plan. It is a State option to pro-

vide none, little, or much medical care. Because there is little expensive long-term medical care in the aid to dependent children caseload it is expected that more funds will be available for dental care. States are being urged to give consideration to expanding dental care for children. Professional guidance in this area is needed, McKneely feels.

Vocational Rehabilitees

The goal of the State program of the Office of Vocational Rehabilitation is restoration of physically handicapped adults to gainful employment through provision of appropriate medical, dental, social, and educational services, stated Dr. Samuel S. Herman, acting medical director, Office of Vocational Rehabilitation. Although data are scanty, there is evidence that participation by dentists in this program has been little more than minimal, despite the substantial growth during recent years in State, Federal, and private funds for vocational rehabilitation.

Well-defined circumstances under which dental defects may be considered vocationally handicapping are the disabilities of persons with cleft palates or of those who have had extensive facial surgery for removal of a malignancy. In these instances, Herman said, unintelligible speech, cosmetic deformity, and inability to eat may be substantial employment handicaps. In such cases, the dentist is called upon to provide services ranging from operating procedures to providing complex prostheses and appliances.

In other instances, the defects may not of themselves represent a substantial employment handicap, but may directly contribute to the severity of another condition which hinders employment. He gave as an example severe peripheral facial paralysis traceable, in the opinion of the examining neurologist and dentist, to a dental focus of infection.

A more frequent need for dental services in the vocational rehabilitation program arises in connection with an employment handicap stemming from multiple disabilities. If a combination of disabilities makes it impossible for the individual to work, it may be necessary to provide corrective measures, including compre-

hensive dental care, to bring about a state of health conducive to satisfactory functioning on the job.

State agencies are encouraged by the Federal office not to establish arbitrary limitations on the types of dental services provided, nor on the amount of money expended for this purpose.

The Office of Vocational Rehabilitation, Herman concluded, also encourages a free choice of dentists and change of dentist either at the request of the client or the dentist.

Care for Handicapped Children

Children with such conditions as cerebral palsy, mental retardation, and muscular dystrophy suffer from the dental neglect and poor care that prevails in many parts of the world, according to Dr. Mannel M. Album, research associate in oral pathology, University of Pennsylvania School of Dentistry. He maintained that recognizing the existence of such dental conditions in these children and the fact that poor dental health is closely related to the overall physical health of the child should be a prime concern of the dental profession. "Dentists have been somewhat reluctant and indifferent in their treatment of these children. The fear of inflicting injury to themselves, as well as to their patients, is caused by their lack of information on the medical backgrounds of the children."

The necessities of everyday living is an important part of the child's motivation and integration into normal life. The desire and willingness of these children to learn and the competitiveness they exhibit makes one realize the deep feeling they have for recognition.

They should receive the same dental care as our own children, Album said. Primary teeth should not be injudiciously extracted, but should be allowed to follow normal growth patterns. Badly decayed teeth, loss of teeth, and severe cases of malocclusion restrict the progress of speech in these children.

According to Album, there is no such thing as an untreatable child, no matter how severe his physical or mental condition might be. With today's modern methods one can insure good, thorough dental treatment. Because of

the child's condition, it may become necessary to adjust the approach and treatment to the individual patient. Cavity preparation and filling should generally correspond to the normal, daily routine.

Clinical procedures should be attempted in the dental office without the use of medication, he said, since this procedure enables the dentist to become better acquainted with the child and his condition. Local anesthesia can be given for cavity preparation as well as for single extractions. If it becomes impossible to work under normal means, the patient can be given one of the muscle relaxing agents or premedication. If all of these measures fail, then the child should be admitted to the hospital.

After the child has received a thorough physical examination and been found suitable for general anesthesia, all of the dental work can be done at one time and the mouth completely rehabilitated. Following this technique, personalities often improve rapidly and children who were difficult to work with in the dental office become excellent patients. The technique enables the dentist to establish a starting point for future dental needs. Album warned against the dentist's use of this method as a crutch or tool to slough off his obligations to the child. It should only be used as a last resort when other procedures fail, he said.

"Children with a handicap must be respected as individuals, so that they can attain their rightful place in society, he concluded."

The Dental Profession

Dr. J. H. Eshleman, chairman of the American Dental Association's Council on Dental Health, reviewed the guiding principles set by the association to aid its agencies in developing dental care programs operated under the auspices of the Federal Government and to assist constituent societies in developing special programs giving dental care to specific groups.

In these programs, the dental profession has established dentistry as a basic health service in the health programs of the Nation and has attempted to integrate dental care into general health care. The development of health pro-

grams for persons with mental and chronic illnesses and the expansion of hospital facilities for the care of such patients are accompanied by a growing recognition of the need for complete dental departments in all types of hospitals. Chronic illness programs, added Eshleman, must provide for the homebound patient who does not require hospitalization but who does require dental care.

He noted that emphasis in health programming has shifted from the individual to the group. Consequently, the profession's expanding knowledge and skill in the management of dental disease must be adapted to the socioeconomic environment of patients, the study of which demands the aid of other sciences such as sociology. Furthermore, the future of dental practice depends on fuller use of the specialized resources of business administration, production technology, and production efficiency.

Eshelman pointed out that there is a trend toward the development of many different forms of group dental practice. Efforts are being directed toward the goal of eliminating the heavy burden of costs for dental health services. An essential and accompanying effort must be made to strengthen the capacities of the State and local dental societies and dental components of health departments.

Dental Resource Studies

"Effective resource studies are not limited to counting heads and viewing with alarm the shortages in personnel which the count reveals," said Dr. Walter J. Pelton, chief of the Division of Dental Resources, Public Health Service. These studies, he asserted, must explore any areas of activity directly or indirectly affecting dentistry's efforts to protect and improve America's oral health. The Division of Dental Resources makes a continuing effort to do this, as indicated by its activities in the last fiscal year.

Pelton cited the division's study in 1956 of requirements through 1975 for dentists and dental hygienists in 11 western States, Alaska, and Hawaii. Prepared for the Western Interstate Commission for Higher Education, the booklet entitled "Dental Manpower Requirements in the West," was published by the commission

in July 1956. A similar study of 16 southern States was conducted in cooperation with the Southern Regional Education Board, which is planning its publication. These studies and two others now in the initial stage—one covering New England and the other, all 48 States—will provide a working base for long-range planning needed to offset the decline in dentist supply.

In education, said Pelton, the division completed a survey of characteristics, finances, and practice plans of dental and dental hygiene students in cooperation with the Council on Dental Education of the American Dental Association. Originally published in the association's journal, it has been reissued as a pamphlet entitled "How Students Finance Their Dental Education." Two additional articles, "The Hygienist as a Student" in the *Journal of the American Dental Hygienists' Association*, October 1956, and "Costs and Income Sources for Dental Students" in *Public Health Reports*, May 1957, are based on the survey, and another, containing added information on loans and scholarships, is in preparation.

Pelton then described two major research programs in educational methods which were also begun in 1956. The first is a pilot project to determine the best techniques for training dental students to work with chairside aides. Although it is only in its first year, 3 of the 5 schools signing cooperative agreements have started active training projects. Probably more schools can be expected to participate in the future. The second program, a study of dental assistants and their jobs, will augment a joint project of the American Dental Assistants' Association and the American Dental Association concerned with training courses for assistants and accreditation standards. Both of these programs are designed to aid development of better curriculums and training methods and to promote more efficient use of professional skills, integral parts of resource planning.

One of the Public Health Service series of manpower surveys, entitled "Health Manpower Source Book, Section 8: Dental Hygienists," has been completed by the division. Pelton feels that it is probably the most complete

analysis of current professional status, availability, and future need for dental hygienists.

Prepaid dental care, expected to have a great impact on dental demand, is a long-term research program. Two conferences were held, the first with prepayment executives, health economists, and dental leaders, and the other with health insurance company representatives; others are in the planning stage. A report entitled "Predictability of Dental Care Needs of Adults" was published in the *Journal of the American Dental Association*, June 1956, and two others, "Dental Experience of the St. Louis Labor Health Institute" and "Utilization Patterns of Free Clinic Facilities by Two Population Groups," are in progress. These studies, analyzing various types of utilization, chair-time, and need patterns in group clinics, should provide important facts in an area for which available data are limited and unsatisfactory, said Pelton.

Also in preparation is a catalog of all existing prepayment plans with details of organization, eligibility rules, coverages, and rates.

He then listed the projects which may be included in the division's future research in prepayment plans:

- An extension of the study of utilization patterns in the Group Health Association dental clinic, Washington, D. C. Supplementing a 1954 report entitled "Comprehensive Dental Care in a Group Practice," it will emphasize long-term service demand patterns.

- The organization and operation of State dental service corporations to study ways by which such a corporation serves as intermediary between dentists and groups seeking dental care.

- The organization, operation, and implications of postpayment dental plans.

"Because of the nature of its research," Pelton said, "the Division of Dental Resources needs and has always received the interest and cooperation of leaders in many fields. That this interest has not died with the publication of our studies but is instead being translated into intelligent and forward-looking action, is, after all, the real achievement of the year's work."

Fluoride Effects on Tooth Surfaces

A study comparing benefits to individual permanent teeth when fluoride ingestion starts at birth and at various ages was described by Grace C. Scholz, statistician, Division of Dental Public Health, Public Health Service. Her report was preliminary to preparation of the full results of the study for publication, she said.

The study, made during 1944-55, was based on the results of 71,000 dental examinations of children aged 5-16 with continuous residence in Grand Rapids and Muskegon, Mich., and Aurora, Ill. These children were grouped on the basis of their homogeneity with respect to age and the length of time they had been drinking fluoridated water. Data for each tooth space of each group were tabulated, and standard statistical measures were used for comparing groups.

Fluoridation

Cities treating their water with alum can now cut the cost of fluoridation at least two-thirds by using fluorspar instead of some other fluoride compounds, according to Franz J. Maier, chief of the Engineering and Chemistry Laboratory, Division of Dental Public Health, Public Health Service.

Heretofore, fluorspar, the least costly of all fluoride compounds, could not be used for fluoridating water supplies, said Maier. It does not dissolve readily. This difficulty was overcome by the development of a fluorspar dissolver. In feeding the fluorspar, an alum solution dissolves the compound, which is fed into the water by a solution feeder.

Nonfluoride Hypoplasias

The great majority of enamel hypoplasias commonly seen is not due to fluoride ingestion, reported Dr. Albert L. Russell, chief, Epidemiology and Biometry Branch, National Institute of Dental Research, Public Health Service. Therefore, he maintained, care should be taken in excluding such cases when computing the community fluorosis index. Incorrect diagnosis of nonfluoride enamel hypoplasias as fluoride-caused has caused confusion, among serious workers in this field, as to the meaning and severity of fluorosis. It has provided plan-

sible if spurious arguments against fluoridation of community water supplies.

Reports of the prevalence of nonfluoride enamel opacities differ and some of the differences may be real, Russell said. Hurme reported one or more opacities in 83 percent of the children in a new England community; Zimmerman saw 36 percent in a Maryland group; Syrrist found "white spots" in 19 percent of a Norwegian group; Parfitt reported a 50 percent prevalence in London children; and Forrest, a 70 percent prevalence in children of Essex and Surrey; both Davies and Russell found such opacities in about 20 percent of the children in Kingston, N. Y. Not one of these groups used a domestic water with more than 0.2 p.p.m. F,

so that none of these opacities could have been due to fluoride ingestion.

Both Davies and Forrest, Russell continued, make the point that these common nonfluoride opacities are much more disfiguring than the slight fleckings seen in communities with about 1.0 p.p.m. F. In children of Essex and Surrey, Forrest found blemishes so severe that they would have been classified as moderate, had they been due to fluoride, in 17 of 259 cases.

In this situation the obligation of the dental public health worker is plain: to learn to diagnose these conditions in the field and to determine their prefluoridation prevalence and character in order to avoid their being ascribed, post hoc, to change in the water supply.

Retirement Histories Studied

The Social Security Administration is asking 3,000 newly retired persons throughout the country to report over the next 12 years how they get along in retirement.

Information obtained through a series of interviews with the older persons will be part of a long-range study to provide more information about the circumstances and problems encountered by social security beneficiaries in their later years.

After the initial interviews in 1958, followup visits in the homes of the same people will be made at intervals of 1 or 2 years over a 12-year period to find out how their situation changes during retirement and the adjustments they make. The retirement experience of this group is expected to throw new light on the problems, interests, and capacities of older people generally.

The initial interviews, which will be conducted for the Social Security Administration by the Bureau of the Census, will cover the year before the interviewees apply for social security benefits so that the retirement histories can be developed from the beginning.

The study will seek the following information from the 3,000 persons:

- How many have sufficient income from their own resources, including old-age and survivors insurance.

- What they do if their financial resources become inadequate to meet their needs.

- How their chief items of expense change as they get older.

- What they do if they incur catastrophic medical costs.

- How long those who were financially independent at the start of their retirement remained so and under what circumstances they get support from their children, public assistance, or some other source.

- Their attitudes toward their retirement and its problems.

- What they think are their greatest unmet needs and how these affect their adjustment to old age and retirement.

A panel of experienced consultants conferred with the research staff of the Bureau of Old-Age and Survivors Insurance in working out the questionnaire and advised on technical problems. The consultants were Dr. Gordon Streib, professor of sociology, Cornell University; Dr. Ethel Shannas, National Opinion Research Center, University of Chicago; Miss Anne Geddes, Community Research Associates, Inc.; Dr. Nancy Bayley and Dr. Olive Westbrook Quinn, National Institute of Mental Health, Public Health Service; and Dr. Oswald K. Sagen, Public Health Service.

Forecast of Dental Service Needs in the South

WALTER J. PELTON, D.D.S., M.S.P.H., and RUTH DEE BOTHWELL, B.A.

TO ERASE the difference between the ideal and the merely adequate in dental care is one of the greatest challenges in public health today. But since the ideal must wait upon the practical, we are concerned with the more realistic goal of providing the dentists the South will need to meet the actual demand for dental care.

This is not easy to do. State and regional boundaries are much more clearly defined on a map than they are in public health planning. The problem which the South faces in providing for the future dental health of its citizens is neither unique nor isolated. The dental manpower problem in Arizona is not only similar to that in Alabama, but the manner in which Arizona solves it will affect Alabama's answer too. A national shortage of dentists has developed—a shortage already limiting the amount of care which people who want it can get.

This shortage dates from the early 1920's, when improved standards of dental education resulted in the closing of substandard schools, and caused a sharp cut in enrollment. During the depression of the thirties, a further reduction occurred. By the time World War II began, there were fewer dentists than there were

prior to 1930, only about half as many students were attending dental school as in the mid-twenties, and not enough new dentists were being produced to replace older dentists who had died or retired. When large numbers of dentists entered the service, the shortage was further aggravated.

Persons-per-Dentist Ratio

The years since the war have seen expansion in training capacity and a rise in new dentists entering the profession. By 1955, nearly 3,100 dentists were graduated from the Nation's schools—twice the number of the last prewar class of 1941. But the population has grown much more rapidly than has the supply of dentists. By 1955, the persons-per-dentist count had risen to 2,169 from 1,870 in 1940 and 1.728 in 1930. With our larger population of 1955, it would have taken nearly 19,000 more dentists than were then in practice to restore the 1930 ratio.

Ratios in every region of the country are less favorable than in 1930, and, for some States, less favorable than in 1920. The States most affected by this adverse trend are those with the greatest population gains. Georgia, Louisiana, South Carolina, Virginia, Delaware, Maryland, West Virginia, and Texas have continued to lose ground, with current ratios considerably less favorable than those of 1940 or 1930. In four of these States, the persons-per-dentist count is now higher than at any time in this century. In fact, the only State in the

Dr. Pelton is chief, and Miss Bothwell, public health research analyst, of the Division of Dental Resources, Public Health Service. The paper was presented in substantially the same form before the American Public Health Association, Southern Branch Meeting, at Asheville, N. C., on May 31, 1957.

South appreciably better off than it was in 1930 is Arkansas, and the only State which has succeeded in stabilizing the count at the 1930 level is Oklahoma. Both have been subject to heavy population losses due to migration. In the remaining Southern States, the 1955 persons-per-dentist counts are considerably better than the 1940 ratios, but are not at the 1930 standard.

The South as a whole, moreover, is still the least well supplied of any region, with only 1 dentist for every 3,572 southerners in mid-1955. This is almost two-thirds more than the number of persons served by the average practitioner in the United States (fig. 1). Florida, with nearly 2,500 persons per dentist, ranks first among the Southern States, but only 24th in the Nation. The remaining Southern States occupy 15 of the bottom 17 positions. At the end of the list is South Carolina with almost 6,000 persons per dentist, about 4 times the number served by the average dentist in one of the top-ranking States.

Although dentists are no more unevenly distributed in the South than in most regions of the country, maldistribution is especially serious because the overall supply of dentists is so limited. In the average metropolitan area, there is 1 dentist for every 2,200 persons. But in the smaller urban counties, there is only 1 for every 3,000 persons, and in counties with no

city of 10,000 or more population, the average dentist serves nearly 4,700 persons. In some States, persons-per-dentist ratios in these less populous counties reach an average of nearly 7,000. In Georgia, 1 in every 4 counties is without a dentist.

Actually, more ground has been lost than is indicated by trends in persons-per-dentist ratios. Because so few dentists were added in the years before the war, we now have a large concentration of dentists in the older age groups. The proportion 55 years old and over about doubled between 1930 and 1950, and the proportion reaching 65 years of age nearly tripled. By 1950, about 1 in every 3 dentists in the South was at least 55 years old, and 1 in 9 had reached 65 years of age. As a result, nearly half of the 14,000 dentists now practicing in the South must be replaced by 1975. Among the Southern States, Delaware, Florida, Louisiana, Oklahoma, and West Virginia face the most serious replacement problems.

Factors Affecting Demand

These needs still represent only a fraction of the total number of dentists required in the future. The population is growing, incomes are climbing, and other changes are taking place to make dental care more accessible in the

Figure 1. Dentist-population ratios in the United States and in the South.

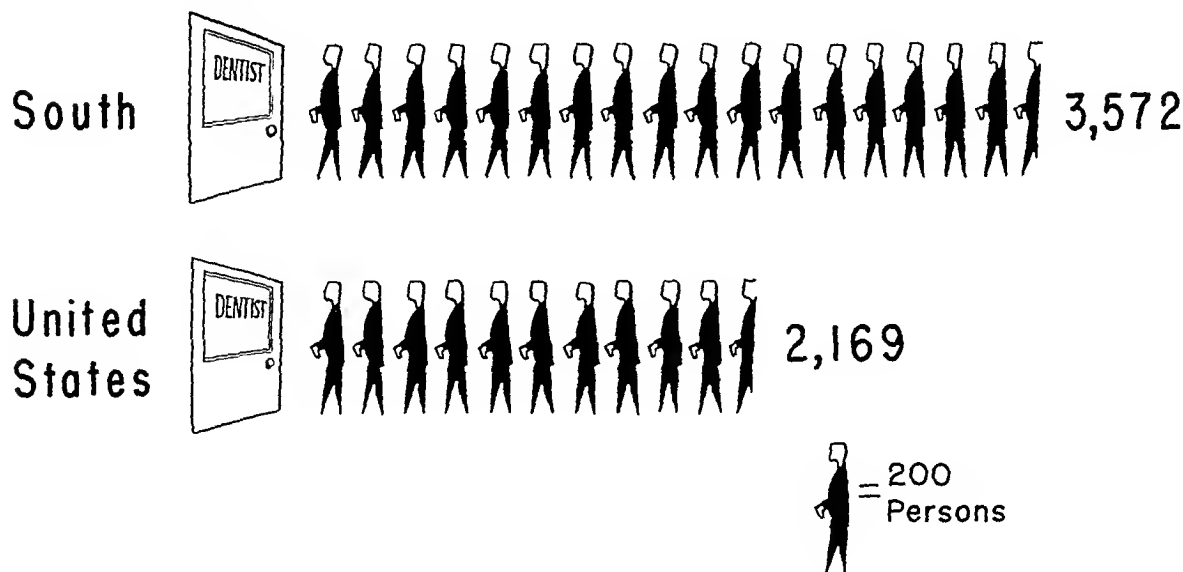
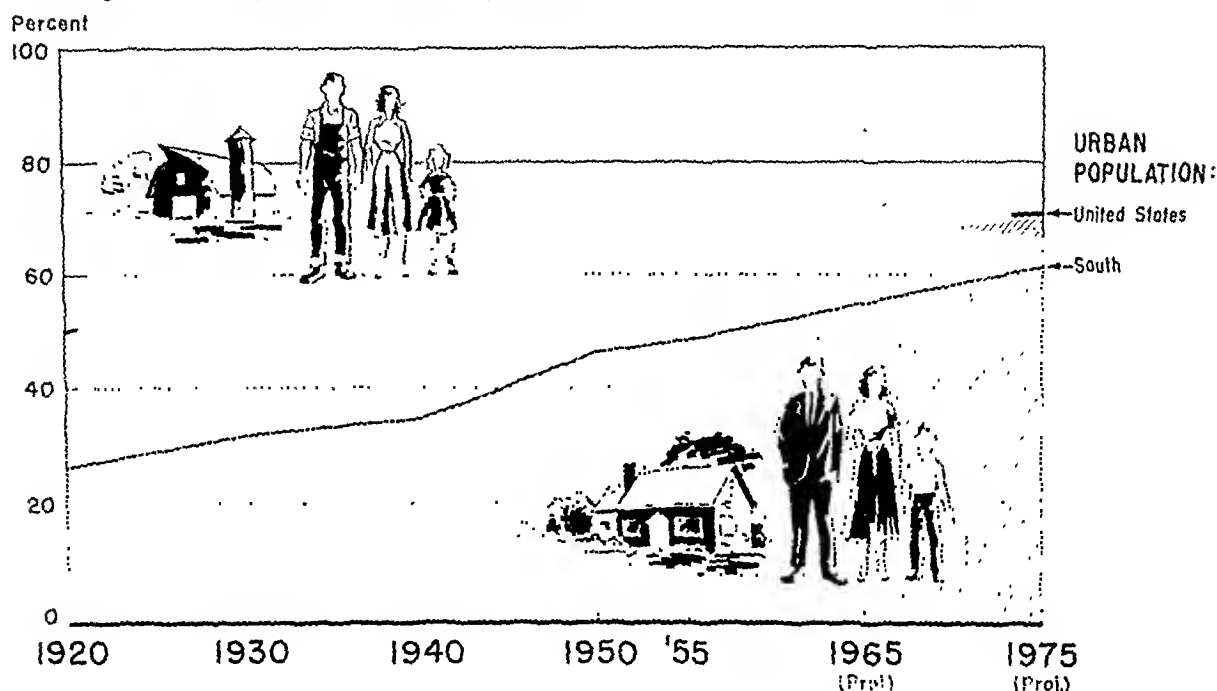


Figure 2. Proportion of urban population in the United States and in the South.



future and more likely to be sought than at present. The South, even though growing less rapidly than the rest of the country, has an annual increase in population of close to 680,000 persons a year compared with an average of 360,000 in the years before the war. Thus the equivalent of a new Dallas or a new Miami emerges full grown each year. Conservative population projections show that the South can expect to see about 640,000 persons added to its present population of about 50 million each year during the next 10 years, and then, in the following 10 years, when all the postwar "babies" start having children of their own, 825,000 a year will be added. By 1975 these figures will mean 15 million new potential consumers of dental services in the Southern States.

More important than growth, however, are changes taking place in the makeup of the population. We are, for example, rapidly becoming a nation of city dwellers. And city folk find it less inconvenient to visit dentists than do their country cousins. Moreover, city folk generally have jobs demanding a minimum standard of personal appearance and have greater cash incomes to pay for dental services. The South is still much less highly urbanized

than are other regions, but it is rapidly catching up with the remainder of the country (fig. 2). In 1930, only 33 percent of all southerners lived in cities; 23 percent less than the national average. Now an estimated 49 percent are urbanites, and the difference between the South and the country as a whole is only 16 percentage points. By 1975, if the trend continues, the southern percentage will be within 9 points of the national average.

This change means that the rural population will shrink, and the 15 million new southern residents projected for 1975 will all have been added to the city population. As a result, instead of the 25 million urban residents of 1955, there will be 42 million in 1975, about 17 million more people living in towns and cities, subject to all the subtle influences that make urban residents the largest consumers of dental services. A good share—perhaps upwards of three-quarters of the net increase in the population during this period—will be registered by the big metropolitan areas, thus facilitating access to specialists' as well as generalists' services.

Education for the average southerner will also be greatly increased (fig. 3). We may assume that the percentage of southerners completing high school will rise until by 1975 it

reaches the level that in 1950 characterized the country as a whole. Approximately 28 percent of all southern adults between 25 and 65 years of age in 1950 had completed high school. But less than a fifth of those 45 years old or over had done so. These will be replaced by better educated youth. And, of course, the number of people reaching 25 years of age during the next 20 years will be very much larger than the number leaving this age group, so that 4 in every 5 people added to the adult population between 1950 and 1975 will have finished high school. Consequently, by 1975, the proportion of high school graduates within the total group will have advanced to 46 percent from only 28 percent in 1950. Probably an even greater proportional change will occur in those receiving college training.

This rise in education in the South will have far-reaching consequences: Adults in general and, more important, the parents among them are likely to have greater appreciation of the value of oral health than is the case today.

Significantly, the States most affected by new levels of education will be those in which these levels now lag most seriously: Mississippi, the Carolinas, Georgia, and Alabama. In States now at the top of the education scale, the number of high school graduates among the adult population will probably double by 1975, but more than triple in the low-ranking States.

The ways in which southerners make a living are also changing in a way that spells greater future demands for dental care. The trend is toward better paying occupations. Professional and technical workers, proprietors and managers of nonfarm businesses, and clerical and sales workers—the so-called white-collar groups—accounted for more than two-thirds of all employment expansion between 1940 and 1950, although they made up only one-fourth of the total work force in 1940. The number of clerical workers increased by about 80 percent, and the professional and managerial groups and the sales group by nearly 50 percent.

Skilled craftsmen showed the second largest

Figure 3. Current and expected portions of adult population with at least high school education, in each of the Southern States.

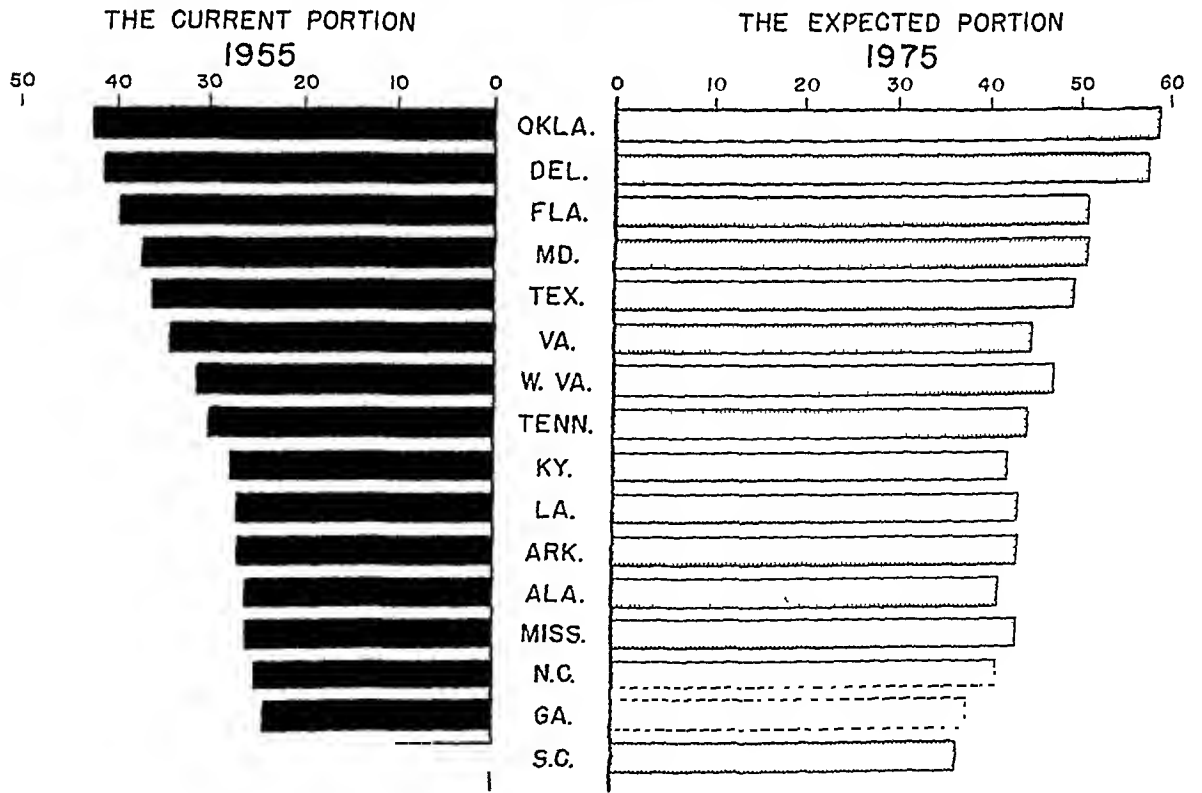
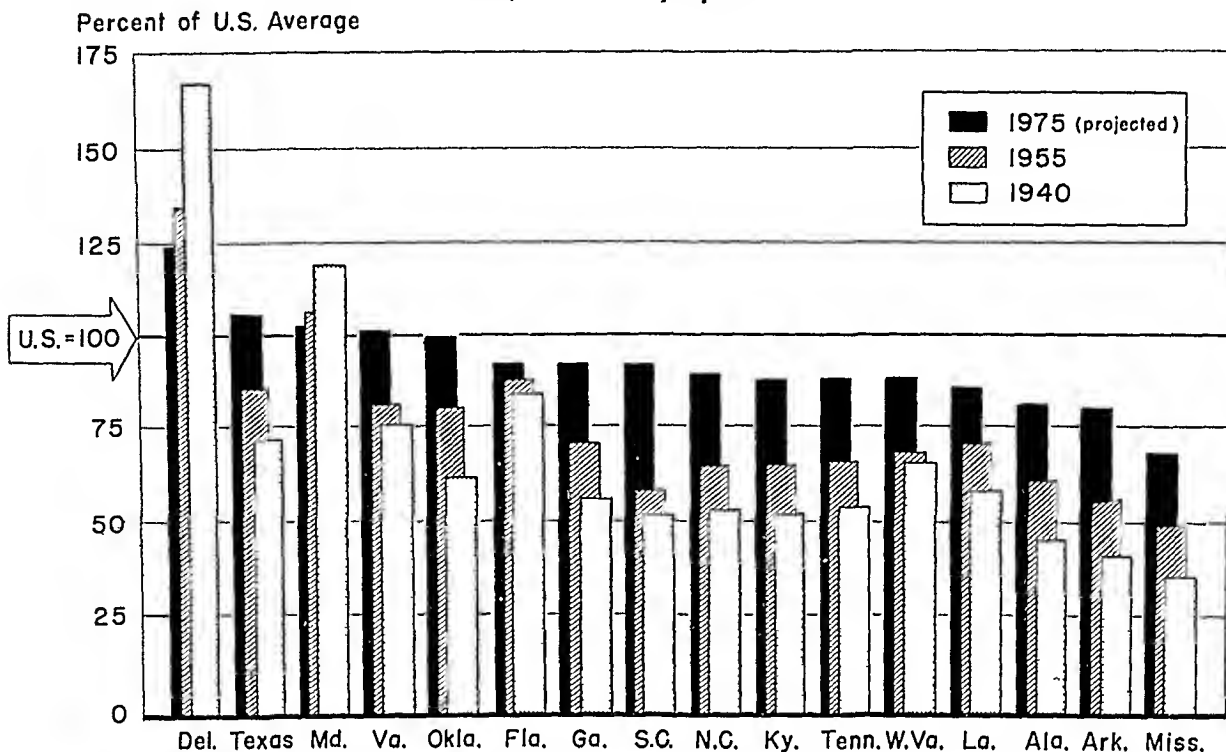


Figure 4. Average income in Southern States as percentage of United States average, for 1940, 1955, and 1975 (projected).



gain of all, increasing by more than 70 percent. The semiskilled occupations, on the other hand, registered a 50 percent increase, while the unskilled group gained but 11 percent. The farming occupations declined.

To a great extent these changes reflect a nationwide pattern. In the South they were far more pronounced during the 1940's than in the country as a whole. They mirror the gradual transformation of the region's economic character.

Southern industrial growth, both during and especially since the war, has been significant, although the region is still more dependent upon agriculture than are other sections of the country. The percentage of the Southern States' income from agriculture was cut in half between 1940 and 1955. At the same time, the percentage increase in southern manufacturing output (as measured by value added to raw materials by fabricating and processing) was a fifth larger than the national rate of increase for this period. Only Maryland, North Carolina, Virginia, and West Virginia failed to outpace the Nation during this period of phenomenal industrial growth.

The shifting economic base of the region has been important in improving the economic status of the average southern citizen, so that he is increasingly able to meet the costs of dental care.

A nationwide survey in 1953 by the Health Information Foundation showed that only 17 percent of the members of families with annual incomes of less than \$2,000 had any dental care within a year, compared with 57 percent of those from families with \$7,500 or more. Dental expenditures in excess of \$45 for the year were reported by less than 10 percent of the low-income families, but by 40 percent of families with higher incomes.

Per capita income in the South has risen almost steadily ever since 1930, in absolute terms and as a percentage of the national average. In the last prosperous year before the depression, per capita income was only 59 percent of the national figure. By 1940, it had climbed to 64 percent and by 1955 to 76 percent. Projections of this trend indicate that by 1965 income in the South will be only 13 percent below the national average, and by 1975, but 4 percent.

When we apply this larger percentage for

1975 to an estimate of what income in the United States will be in 1975, the resulting change for the South is breathtaking. Parenthetically, this national figure is based on projections which already appear conservative. Expressed in 1955 dollars, average personal income in the Nation will rise from about \$1,850 now to about \$2,550 in 1975, an increase of about \$700. Southern per capita income, however, will rise by \$1,050, climbing from \$1,400 to \$2,450.

Where incomes are already above the national average, they will tend to drop as a percentage of the national figure. In most of the States, however, incomes will rise more rapidly than in the Nation and by 1975 will be a much higher percentage of the national total than they are today. By 1975, Delaware, Oklahoma, Maryland, Texas, and Virginia will have average in-

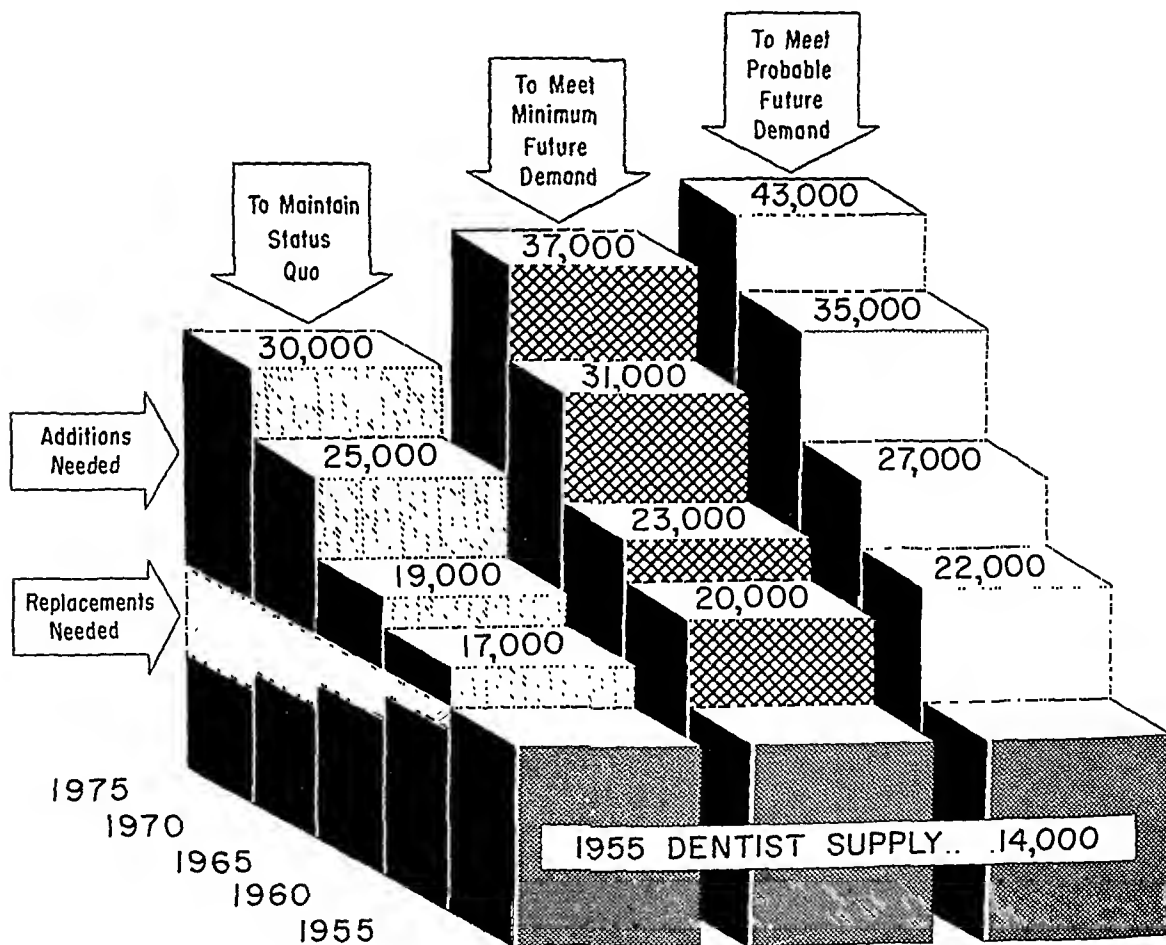
comes exceeding the national figure. South Carolina will make the greatest progress (fig. 4).

Future Manpower Needs

With per capita income going up to nearly twice its current level and the population growing by some 15 million, the total income available in the Southern States will increase enormously by 1975. If we assume that these States will spend no greater share of that future income on dentists' services than they do today, the South will need approximately 16,000 additional dentists by 1975.

Yet today the South has fewer dentists in relation to income than any other region, even after full allowance is made for low educational attainment and the large rural population. For

Figure 5. Current and projected need for dental services in the South.



this reason, it is realistic to assume that future demand will at least equal that of 1955 in the average State and will more probably approximate the average for the 24 top-ranking States, provided again that differences in education and urbanization are taken into account.

To increase the dentist supply in each Southern State sufficiently to meet the demand level existing in today's average State, nearly 23,000 additional dentists will be required by 1975.

However, to bring the dentist supply up to a level equivalent to the average among the 24 top-ranking States today, a level adequate for meeting probable demands for service, about 29,000 more dentists will be needed by 1975. Add to these figures the 7,000 necessary as replacements for those who die or retire and the results are staggering.

At every level of estimate, Texas, Florida, Virginia, and Maryland account for approximately half of the region's entire requirements. Delaware and South Carolina will have greater proportionate needs, however. In these States, additions and replacements needed by 1975 to meet probable service demands are equal to about four times their current dentist totals. Even Arkansas, Mississippi, Oklahoma, and West Virginia, with the smallest proportionate

needs, will have to attract $1\frac{1}{2}$ times as many dentists by 1975 as they have now.

Estimates of future supply prepared 2 years ago by the Division of Dental Resources, Public Health Service, indicate that the Southern States will fall seriously short of these goals. In spite of current and projected expansion in training capacity, it seems unlikely that the region can build up its dentist supply sufficiently even to maintain the status quo unless training facilities are substantially increased.

What the South can do to avert the acute shortage of manpower is now under study by the Southern Regional Education Board, set up and supported cooperatively by the Southern States to further education opportunities of their youth.

The manpower requirements presented here are really minimum requirements for attaining a standard of oral health that we already know to be far from satisfactory. Staggering as they may seem from a distance of 20 years, the estimates of future needs are only a fraction of the dental force necessary to provide the southern people with the care that they should have. As realists, we accept the lesser goal of meeting demands for dental care, but we must intensify our efforts to stimulate people to seek the care they need. In dentistry as in all health care, nothing less than the ideal can ever be adequate.

Course in Epidemiology for Nurses

Epidemiological principles, the role of the laboratory in epidemiology, and the application of practical statistical methods to the problems in field epidemiology will be studied in terms of current major communicable diseases from April 14 through May 2, 1958, at the Communicable Disease Center in Atlanta, Ga.

Those eligible for admission to the course are communicable disease nursing consultants, public health nursing supervisors, educational directors, qualified public health staff nurses, industrial nurses, instructors in schools of nursing, and other nurses having supervisory, teaching, or consultant functions.

Application forms and further information can be obtained from the Chief, Nursing Section, Epidemiology Branch, Communicable Disease Center, Public Health Service, 50 Seventh Street NE., Atlanta, Ga., or from the director of public health nursing of the State health departments. The closing date for acceptance of applications is March 17, 1958.

World Incidence Of Anthrax in Man

HAROLD N. GLASSMAN, Ph.D.

MAN and a wide spectrum of animal hosts are susceptible to anthrax. The disease is enzootic in many areas of the world, with concomitant contamination of the soil in those areas. The disease occurs in the economically important domestic animals—sheep, cattle, horses, goats, swine—and it is largely from contacts with these animals or with industrial raw materials derived from such animals (hair, hides, bristles) that man becomes infected.

Existing reviews of the extent of anthrax in man throughout the world (1, 2) have definite limitations. The epidemiological monographs of Simmons and co-workers (1) make what are primarily qualitative references to the incidence of anthrax in a number of countries. A recent paper by Kaplan (2) which was presented at the Symposium on Anthrax in Man held at the University of Pennsylvania in 1954 reports quantitative statistical data on the incidence of this disease but restricts its attention to the years 1951–53. A better appreciation of the world distribution of anthrax in man can be obtained by consideration of epidemiological reports covering a longer period of time. This is true because a number of nations wherein anthrax has been prevalent in recent decades currently do not submit epidemiological statistics to the World Health Organization.

The incidence of human anthrax in a number of selected countries has been tabulated for the period 1924–53 (see table). The epidemiological data have been extracted from statistics published by the World Health Organization for the years 1939–53 (3), and by the Health Organization of the League of Nations for the years 1924–38 (4), and computed as average experience per year at 3-year intervals.

Dr. Glassman is assistant scientific director of the laboratories of the Army Chemical Corps at Fort Detrick, Frederick, Md.

The incidence of human anthrax is probably correlated with the enzootic status of the disease in the animal population of the country or, as in the United States, with the importation and industrial use of infected animal products. There is no necessary relationship between the population of a given country and the incidence of this disease. For example, the Cape Verde Islands, with a population of approximately 148,000, has had from 52 to 105 cases per year for the last 4 years for which statistics are available (1950–53). Other examples of comparatively small countries with a high incidence of human anthrax are Kenya with an experience of 200 to 1,000 cases per year in a population of approximately 6,000,000; and Portugal with an experience of 1,174 to 2,270 cases per year in a population of approximately 8,000,000.

Inspection of the table reveals that human anthrax is prevalent in Africa (French West Africa, Kenya, Ruanda-Urundi, Tanganyika), South America (Argentina, Chile, Uruguay, Venezuela), Europe (Bulgaria, Italy, Portugal, Rumania, Spain, Yugoslavia), the Near and Middle East (Iran, Iraq, Turkey), and Eurasia (U.S.S.R.). Only a few cases are being reported currently from North America and Oceania.

It is interesting to note that, in countries where the incidence of human anthrax is high and where statistics are available over a number of years, there is no evidence of any significant change in the incidence of anthrax over the 30-year period 1924–53.

There appear to be adequate reasons to conclude that the statistics of the international health organizations relative to the incidence in man of anthrax are understatement of the actual facts. Reasons for such a conclusion are:

1. Communicable diseases in general are under-reported. Among the factors that would be of particular importance in considering the completeness of the reporting of human anthrax would be the accuracy of diagnosis of this disease. It has also been suggested that in countries where the term "charbon" is used for both anthrax and carbuncles, inaccuracies in reporting may result.

2. This disease is prevalent in many coun-

tries which do not observe the most advanced public health practices (for example, various portions of Africa). Reports from such countries cannot be expected to represent the actual number of cases occurring.

3. Anthrax is not a notifiable disease in many countries where there are a priori reasons to believe it occurs with some frequency (for example, Afghanistan, Algeria, China, Czechoslovakia, French West Africa, and Iran).

4. A significant percentage of cases of human anthrax go unreported even in countries where public health standards are high and where notification of the disease is compulsory. For example, in the United States in fiscal year 1956, a total of 29 cases of human anthrax were reported to the National Office of Vital Statistics. The Epidemiology Branch of the Communicable Disease Center, Public Health Service, has found and obtained surveillance data on nine

Incidence of human anthrax in selected countries, 1924-53¹

| Place | 1951-53 | 1948-50 | 1945-47 | 1942-44 | 1939-41 |
|---------------------|----------------------|------------------------|-----------|---------|-----------|
| Argentina | 321 | | | | |
| Bulgaria | | | 1,525(46) | 709(35) | 624(40) |
| Cape Verde Islands | 85(5) | | | | |
| Chile | 298(26) | 359(40) | 525(49) | 715(84) | 361(55) |
| French West Africa | ² 324(95) | ³ 430(41) | | | |
| Greece | 144 | 231 | 319 | 58 | 36 |
| Hungary | | | | | |
| Iran | | | 1,524(27) | 639(15) | 2,318(38) |
| Iraq | 253(1) | 157 | 132(1) | 107 | 99(3) |
| Italy | 1,119(13) | 1,223 | 1,710 | 826 | 787(85) |
| Kenya | 807(27) | 844(37) | 597(30) | 297(9) | 214(13) |
| Portugal (mainland) | 1,384(13) | ³ 2,270(35) | | | |
| Rumania | | | 880(63) | 674(48) | 1,089(67) |
| Ruanda-Urundi | 451(7) | 336(12) | | | |
| Spain | 1,078 | 1,601(33) | (83) | (98) | (181) |
| Tanganyika | 422(16) | 203(8) | 294(21) | 97(10) | |
| Turkey | 1,555(30) | 1,405(44) | 1,421(91) | 837(60) | 748(52) |
| Uruguay | 84 | 59 | 88 | 153 | 123 |
| United States | 51(2) | 54(3) | 50(5) | 73(10) | 80(8) |
| U.S.S.R. | | | | | |
| Venezuela | 126 | 235 | | | |
| Yugoslavia | 1,105(26) | 1,108(32) | | | |

| Place | 1936-38 | 1933-35 | 1930-32 | 1927-29 | 1924-26 |
|---------------------|------------|------------|---------|---------|---------|
| Argentina | | | | | |
| Bulgaria | 914(64) | 1,026(65) | 856(75) | 465(52) | |
| Cape Verde Islands | | | | | |
| Chile | 289(86) | 223(79) | (94) | (108) | |
| French West Africa | | | | | |
| Greece | | | | (198) | 8 |
| Hungary | | | (47) | (64) | |
| Iran | | | | | |
| Iraq | | | | | |
| Italy | 1,128(138) | 1,278(151) | 1,653 | 2,053 | 2,288 |
| Kenya | 132 | 113 | 110 | 82 | |
| Portugal (mainland) | | | | | |
| Rumania | 2,228(385) | 1,293(264) | | | |
| Ruanda-Urundi | | | | | |
| Spain | | | | | |
| Tanganyika | | | | | |
| Turkey | 769(56) | 566(40) | 413(42) | | |
| Uruguay | | | 75(17) | 79(10) | 126 |
| United States | 65(10) | 53(13) | 67(23) | 80(19) | 137 |
| U.S.S.R. | | 2,569 | 4,542 | 15,950 | 15,435 |
| Venezuela | | | | | |
| Yugoslavia | 649(53) | 744(75) | | | |

¹ Number of cases are averages per year. Figures in parentheses represent number of deaths.

² Data represent 1951 only.

³ Data represent 1950 only.

additional cases which apparently were unreported (Division Project No. 201-E-45).

5. Several countries which currently do not submit epidemiological statistics for inclusion in World Health Organization reports have, in reports published some time during the past 30 years, indicated that human anthrax occurs with some frequency within their borders (see entries for Bulgaria, Hungary, Rumania, and U.S.S.R. in table). The following countries did not submit data for inclusion in the most recent (1953) yearbook on epidemiological and vital statistics of the World Health Organization: Albania, Bulgaria, China (except Taiwan), Czechoslovakia, Hungary, Liberia, Poland, Rumania, Saudi Arabia, U.S.S.R., and Yemen.

The countries presently providing their statistics on the incidence of human anthrax to the World Health Organization report a total of approximately 9,000 cases per annum. When one reviews the statistical data from the League of Nations and the World Health Organization for the period 1924-53 (see table), and gives due consideration to the reported data understating the actual situation for the reasons out-

lined above, one can reasonably conclude that the incidence of human anthrax in the world in recent years has amounted to 20,000 to 100,000 cases per annum. Anthrax is thus seen to be a much more frequently occurring disease in man than one might conclude from considering only the experience in such countries as the United States. It is also worth reiterating here that the incidence of this disease in many parts of the world appears essentially constant for the years under review.

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Mental Health in Industry

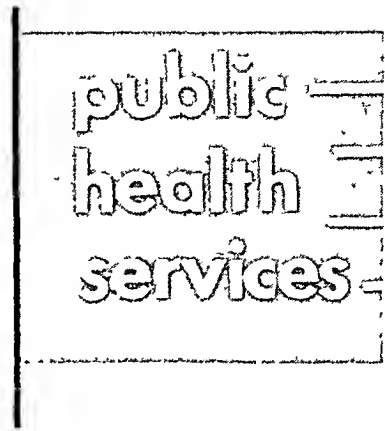
Results of a survey of industrial mental health conducted by the National Institute of Mental Health, Public Health Service, at the request of the State and Territorial mental health authorities, have been compiled and issued under the title "A Review of Mental Health in Industry."

The review contains a summary of the recent literature, a bibliography of 150 titles dealing with psychiatry and mental health in industry, a description of representative mental health programs, and a list of films on human relations in industry. It also provides an overview of the medical aspects of industrial mental health.

The publication was prepared by the Institute's Community Services Branch, which furnishes technical assistance and consultation to the States in the conduct and development of their mental health programs.

Copies of *A Review of Mental Health in Industry* can be obtained by writing to the National Institute of Mental Health, Public Health Service, Bethesda 14, Md.

The State of the Nation's



Abridged reports from the 56th Conference of the Surgeon General of the Public Health Service and the Chief of the Children's Bureau with the State and Territorial Health Officers, Mental Health Authorities, and Hospital and Medical Facilities Survey and Construction Authorities, November 3-8, 1957, Washington, D. C.

Building the Protective Wall

**By Leroy E. Burney, M.D.
Surgeon General of the
Public Health Service**

The record of public health in the United States has been established in great part through the individual and collective efforts of State and Territorial health officers. That record is an enviable one. To be sure, the people are not always as gratefully aware as we would like them to be of the hidden services which form a wall of protection around their families and communities. Just as surely, we who are occupied full time in the practice of our specialty are sensitively aware of the

gaps in that protective wall and the inadequacies of our resources. But, on balance, the informed but detached observer would be forced to the judgment that the public health system which covers the Nation has become a relatively efficient factor in the good life which this country enjoys.

Foreign visitors traveling now in the United States are much impressed with our home heating plants and washing machines, even with our mail order catalogs. I am positive that they are impressed, too, with the high degree of health protection which our people accept so casually in their communities and as they travel from State to State.

My appreciation, however, comes equally from the assurance conferred by experience that this same Federal-State cooperative approach and this same sharing of the load will continue to be the American way of seeking

better solutions for unsolved health problems and rational approaches to new problems.

A current example is the influenza vaccination program. From first alert to full-fledged operation has taken an amazingly few months. The manufacturers produced by December 1 more than 60 million cubic centimeters of Asian influenza vaccine—a good 2 months ahead of original estimates. Equally outstanding is the efficiency of our nationwide communications system and the competence of our specialists in public information and health education, which have made the American people active participants in a truly national effort.

There are many imperfections in the influenza vaccination program, as inevitably there will be in such large-scale operations. But preventive medicine has kept better step with the natural forces of an epidemic in this instance than it has ever been able to do in the past. At no time was it claimed that we could stave off the epidemic from this country. Nor was it claimed that the program was initiated in the guise of a defense against mortal illness. But we are just now beginning to see the more serious attacks occurring in older age groups and other high-risk groups which show a higher mortality rate. As the vaccine now becomes more generally available, let us intensify our efforts to see that as many individuals as possible have the benefit of vaccine protection.

It seems axiomatic in the health officer's existence that he has never finished one urgent task before at least one more demands his attention. While we have been preoccupied with influenza, we dare not forget the partially won victory against poliomyelitis. An effective vaccine is available in adequate supply. Its use to date has produced remarkable reductions in paralytic poliomyelitis. But we cannot close this chapter until we know that the 80 million unvaccinated and partially vaccinated persons under 40 years of age have received protection before the next high-incidence season.

On still another front, we are faced with a host of problems each of first magnitude. Growing populations, finite natural resources, technological changes in industrial production and daily living—all confront us with self-

made threats to health and life, comparable to those previously offered by microbial hazards. Those who are surrounded by these problems need scarcely be reminded of the flat necessity of moving forward in water and air pollution control and, most emphatically, in radiation protection.

We have so much to learn in the realms of biophysics and biochemistry that we need expect no quick and simple answers to these questions. But by hard, unrelenting toil, we must learn more of the toxic effects on man—in long-continued, low-concentration exposures—of the many physical and chemical forces to which he is now exposed. We must also have increasing precision in the measurement and analysis of the physical and chemical components themselves so that we can define and evaluate existing exposures accurately.

From increasing biological and technical knowledge will come eventually standards of safety to which all can subscribe. And we must put the same intelligence which is producing man's new environment to work in devising the means to hold those standards. Meanwhile, we must do whatever we can to reduce excessive concentrations harmful to man's health and safety. For while we recognize the necessity and the values of new factors in modern life, they must be kept in balance if man is to realize his ambition to continue to exist in reasonable health and happiness.

We have made some progress toward this objective in nationwide programs to cope with water and air pollution. Public health, however, has not yet taken its proper place in radiation protection. The increasing medical and industrial uses of fissionable materials place this responsibility in the realm of community health protection, since these major sources of exposure are the common experiences of life and work, rather than the extraordinary and occasional experiences related to military operations.

As I look through the agenda for this conference, I find some old familiar items. But a comparison of topics year by year very surely shows us the trends of our concern.

We will be discussing the topics I have already touched upon. We will be concentrating even more vigorously on training activities.

We will add improving steps to things we have done before.

An example of the latter is the improvement of working relationships in the field of records and statistics. I note with considerable satisfaction the report of the Joint Committee on Vital Records and Health Statistics which offers solutions to certain problems in the maintenance of comparable data and uniform records in our national and State programs.

Finally, we will be discussing with greater emphasis the problems of chronic disease control and health of the aging. This year grant-in-aid funds have been made available to help surmount some of the financial barriers that inevitably block the development of new and unfamiliar projects. The reports we have received from the States on their plans for the use of these funds are encouraging. They indicate a real beginning toward the comprehensive, balanced programs that will not only attack the major causes of disability, but also will make life healthier, happier, and more meaningful for millions of our older citizens.

Public health must take the lead in changing that intolerable and unnecessary situation of having tens of thousands of persons in the richest nation of the world deprived of the very high quality preventive and rehabilitative services which it is now possible to provide. I am pleased to see that you are taking up this challenge by devoting a considerable portion of your agenda to nursing home operations and other equally practical and down-to-earth aspects of this problem.

Very crucial to the development of better services for the chronically ill and to all of the newer programs that concern us is the question of how to organize them within our existing community structure.

There is always a greater lag between a new concept involving human relationships and its support by the public than between the discovery of a "miracle drug" and public acceptance. How then do we modernize our public health structure at the point where it counts most—the local health agency? We are fortunate indeed at this conference to be able to draw upon the personal experiences of local health officials who have successfully answered that question. Those of us in Federal and State

agencies have much to learn from local officials, who are at the delivery point of public health services.

As always, the plans we make together will affect the lives and welfare of all our people. But now we must plan in a setting, on the one hand, of greater and greater demand for vast expenditures for military defense and world security, and, on the other hand, of a growing realization that there must be some reasonable limitation on taxation and government spending.

We work as usual within these constricting factors. We will feel them even more within the next few years. But we can never forget our responsibility to keep the Nation aware that its defense, its security, its hopes for world peace depend primarily upon a healthy and vigorous people protected in their homes, schools, workplaces, and communities by health services sufficient unto the day of a new and changing world. We know that without the work of the Nation's health agencies there will be less to defend and less with which to do it. From this inner conviction we must draw the strength that keeps us to our tasks.

Grants-In-Aid Reappraised

By John A. Perkins
Under Secretary of Health,
Education, and Welfare

My remarks are concerned with a fundamental problem of American government that has been much debated since the days of Hamilton and Jefferson. In 1908, Woodrow Wilson declared the question of the relationship of the States to the Federal Government to be the "cardinal question of our constitutional system." It still is.

Public health is where it is today owing in large part to the evolution of the Federal-State relationship in the last 30 years. The new Federal-State relationship, heralded in the 1930's as the "new federalism," was brought about largely through the grant-in-aid device.

There were definite weaknesses among the States that these grants—matching, stimulatory, and other varieties—were initiated to overcome. The complexities of 20th century urban life seemed to require legislative and administrative action with respect to public health, safety, and welfare. These areas of public activity were not delegated to the Federal Government. They were reserved to the States.

A few commonwealths, generally the wealthier ones, did enter upon social legislation, regulation, costly research, and other concomitants of modern government. In these States, industry and citizens found some of their individual and corporate freedom reduced in order to promote the health, safety, and welfare of the people as a whole.

Industry and citizens either sought sanctuary, or threatened to do so, in other States which had fewer regulations and lower taxes. In the poorer States modern services could be financed only with the greatest difficulty, if at all. Capacity to tax in support of such governmental services varied greatly from State to State. Even where there was the wealth and a fairly satisfactory revenue system, the legislature did not always understand the wishes or requirements of the people. Many of the legislatures were not really representative because they were not properly reapportioned as State population patterns changed. They did not, and sometimes still do not, reflect the predominantly urban culture that has developed in the United States.

Then, too, in many commonwealths, executive authority has been diffused among the governor and a host of other elective State officials. Fixing responsibility for initiation of executive policy—or the failure to initiate it—has been difficult. It became increasingly evident that the extent and quality of some services of government, such as fighting disease and safeguarding public health, while local by fact of original Federal-State arrangement, were national in their consequences. The Federal Government had to act.

Grants-in-aid to the States administered by the Public Health Service were first introduced in 1918. This first grant, which was for venereal disease control, gradually dwindled to nothing

by 1926. Grants were not reinstituted for public health services until 1935 with the passage of the Social Security Act. Title VI of that act, administered by the Public Health Service, provided for general health grants. To this authority were added venereal disease control grants in 1938, and with the codification of Public Health Service legislation into the Public Health Service Act of 1944, tuberculosis control grants were authorized.

The year 1936 was historically significant for expansion of health and welfare services for children. The Children's Bureau, which from 1921 to 1929 had administered funds for maternal and infant health, was enabled under the Social Security Act to aid the States in greatly improving and extending services for maternal and child health, crippled children, and child welfare.

Subsequently, mental health and hospital survey and construction grant authority emerged in 1946, and heart disease control and water pollution control grants in 1948. In addition, annual appropriation language beginning in 1948 provided the basis for grants in cancer control and in 1949 for a special public health grant to the Territory of Alaska.

Grants for the construction of hospitals were extended in 1954 to other types of medical facilities. In 1955 came Salk vaccine; funds were made available to the States through the special poliomyelitis vaccination assistance program. In 1956 grants were made available to strengthen State and interstate water pollution control programs and to assist municipalities in the construction of waste treatment works. Also in 1956 grants were approved for a national mental health study, for vocational training of practical nurses, for further professional training of graduate nurses, and for a public health traineeship program. In 1957 Guam was made eligible for Public Health Service grants, and special grants were made for projects for mentally retarded children.

Every State now has a mental health program. In 1946, which was a year before the Federal Government started making grants-in-aid to States for mental health services, such programs were in formal existence in only seven States.

The Hill-Burton program has stimulated a

substantial volume of needed hospital construction, especially in low income rural areas. This Federal assistance to local hospitals has brought about improvement in standards of design and has indirectly improved standards of operation, through encouragement of State licensure. Federal support of specialized health programs has brought great benefits to the American people.

In the evolution of these grant programs, however, certain disadvantages have become apparent:

First, the grant process has so improved those functions of government which are of immediate interest and concern to the individual that people generally have felt little or no need to insist on correction of the weaknesses in the organization of State and local governments that helped to give rise to Federal intervention in the first place.

Second, the people most directly affected have, to a certain degree at least, been removed from the process of decision making.

Third, the grant process makes it difficult to relate the tax bill to the services received. Federal expenditures, expanded as they are by large outlays for defense, come to seem unconscionably high to taxpayers. Unfortunately, the taxpayer is not aware that much of the service he is receiving at the State and local levels depends to a considerable extent on the Federal tax he pays. If State and local taxes paid the whole bill for the services received on the State and local levels, the taxpayer could readily decide whether the services were worth the cost.

Fourth, the responsible expenditure of any public money requires certain safeguards to make sure that the money is expended prudently for the purpose for which it was provided. In carrying out this responsibility, Federal officials frequently encounter complaints that such safeguards constitute an intrusion into State and local affairs.

Fifth, one of the great advantages the Federal system of government offers has tended to atrophy. I believe it was Justice Oliver Wendell Holmes who spoke enthusiastically of the opportunities our Federal system affords for State governments to serve as laboratories where experiments in government might be made. State officials have been so busy carry-

ing out the many programs initiated at the national level that there has not been enough time for inventiveness and special adaptations to local requirements on State initiative.

Sixth, State budgets have been somewhat distorted by the matching process. There is a natural tendency in the State budget offices and State legislatures to finance those activities for which the Federal Government puts up part of the money. The maximum Federal dollars are usually sought whether or not there is sufficient money left to finance the functions wholly dependent upon the State and local governments.

These are some of the specific problems in the grant mechanism. There is a related phenomenon. Grants originated to stimulate a particular program have a strong tendency to become frozen into the pattern of State budgeting. The Federal Government may believe that one grant program has served its stimulatory purpose. It senses another area where greater activity is needed in the national interest. The logical thing in that case would be to drop or greatly reduce the first grant program, leaving the remainder of the job to State and local authorities. The Federal money thus freed could then go into the new activity needing attention. But it is not quite that simple. There is a danger that when Federal money is withdrawn the States will not make up the difference.

In addition to these basic questions, there are now other circumstances that suggest reevaluation of the grant system. Sums required to maintain our military strength and that of our allies constitute a large burden on the national budget. A great many of the special taxes levied during the war are still with us. Those who would have bigger, better, and more grant-in-aid programs cannot with very good logic also demand that the Federal Government slash taxes and surrender tax sources to the States.

If State and local government is to be made as strong as all seemingly would have it, two things must be done. First, State and local administrators of government must be alert to emerging problems. In the field of public health, this means facing and solving such prob-

lems as those of the chronic diseases, the hazards of radiation, and economics of medical care, to name a few.

Second, we must so educate and inform our citizens on the importance of progress in public health that they will not be satisfied with anything less than the best programs possible. Here in the support of the citizen-taxpayer lies the secret of how to build sound and progressive public health programs. It is to your credit and that of State and local appropriating authorities that State and local funds for public health have been increased an average of 47 percent in the last 5 years. Some States have increased appropriations more than 100 percent in this period. In fact, State and local expenditures for public health, not counting maternal and child health programs, have increased from 74 percent of the total to 93 percent of the total since 1940. This record of what has been done in the past portends well for what can be done in the future.

I want to make it crystal clear that I am not calling for abandonment of the grant-in-aid device. There is, of course, a strong national interest in public health. Federal grants-in-aid have proved to be an effective means for furthering that interest and for smoothing out, at least on a minimum basis, the variations in wealth among the States. However, I am suggesting that realities of today's world and its demands on the Federal budget require that the States and local communities assume an increasingly greater part of both the burden and the challenge presented by the public health needs of the future.

Children in a Changing World

By Katherine Brownell Oettinger
Chief, Children's Bureau

A number of factors now influencing our national life and economy call for a great deal of vision and adaptability in the future direction of the Children's Bureau programs.

A demographic factor with particular significance is the sharp and continuing rise in our

young population. This increase in the number of children is already taxing our services, most evidently in the schools, but also in the areas of health and welfare. Obviously, health and welfare services must be expanded to match this population increase even quantitatively. It is of particular concern to us because for this age group so much of the work is preventive in nature.

The rising cost of medical and hospital care—indeed, the rising cost for providing most of the services which are our concern—call for a high degree of administrative ingenuity in all our programs. In my opinion, such ingenuity must always be coupled with a program to promote understanding of the importance of the services we, as health and welfare workers, are giving.

We are indeed in an era where we must all run very fast to stay in the same place, and yet I know how dedicated you are to the principle of progress, of steadily building on the basis of new program concepts, of putting new knowledge to work as it becomes available.

I can think of no more vivid example of the States' desire to make progress than the way they have responded to the impetus of a small amount of special project Federal money to develop community programs for retarded children. As of now, 28 States are receiving these special project grants, and plans for 3 more States are in the process of approval. The grants for these 31 State projects total \$1,338,530 for the current fiscal year. In addition, five other States are financing mental retardation programs with regularly apportioned Federal maternal and child health funds and State and local matching funds.

This speaks eloquently for your inventiveness and experience in the development of maternal and child health demonstrations. That it was accomplished within the space of 1 year in the face of recruitment difficulties and our lack of experience with clinical services for mentally retarded children adds to the stature of your achievement.

We all know that parents of retarded children have been the primary moving force in developments in the field of mental retardation. Parents are always a strong force in a democracy, and they represent a group to which

the Children's Bureau is responsive. The impetus to these developments presents fresh evidence of the contribution which citizens can make. This is one more chance that traditionally comes to the Bureau to put democracy to work.

Developments in the field of mental retardation are again proving the validity of the "team" approach in children's services. In these services, a number of States have developed effective working relationships among departments of health, education, and welfare, and involving parent groups as well. Of particular interest to us also, in connection with these project grants, are those projects now being carried out by medical schools in which practicing physicians, medical students, and nurses are gaining working knowledge about mental retardation. Our future medical graduates will have a much better understanding of retardation than generally exists at present.

In these few months in the Children's Bureau I have been impressed by the vast impact which the three categories of grants the Bureau administers—in maternal and child health, crippled children's services, and child welfare services—have had on the development of services for children in many States and localities.

Through the administration of its grants programs, the work of its regional offices, and annual conferences such as this, the Children's Bureau can stay constantly aware of changing conditions in State and local health and welfare programs to which it must be sensitive if it is to be responsive to the needs of mothers and children.

Trends in Child Health

We are all heartened by the emergence of a broad concept of rehabilitation in health, education, and welfare agencies. I speak now of rehabilitation as "making the best with what one has." This concept involves optimum social, emotional, and physical restoration, as well as the prevention of progression of disability.

One example of this trend is the increased interest in programs of service to child amputees. At the area amputee center at Grand Rapids, Mich., for instance, the project staff are making possible the rehabilitation of extremely handicapped children, with results which so far have

been notable. As you know, the services of this clinic are available to a child amputee needing such specialized services from any State.

A cooperative venture on the part of the University of California at Los Angeles, the California State Department of Health, and the National Research Council, aided by a grant from the Children's Bureau, has made possible the child amputee research project at the University of California at Los Angeles. Here, particular attention is being given to the technical aspects of fitting children who are amputees, as well as to the psychological and social aspects. They are asking such questions as: How do children respond to prostheses? When should a child be fitted for a prosthesis? What is the best way for him to learn to use it? How does the congenital absence of an arm affect his growth and development? What defense mechanisms do parents develop to gain better acceptance of the prosthesis by both child and parent?

Incidentally, the Children's Bureau was able for the first time in 1957 to gather some information on the prevalence of amputations among children. On the basis of reports submitted by crippled children's agencies in 25 States, it would appear that about 1 percent of all children served in those programs lacked one or more limbs or parts of extremities.

We also see a trend away from long-term hospitalization for the child, and toward helping the family in providing care in the home. This trend in medical care programs is paralleled by a trend in child welfare programs which places increased emphasis on helping children in the setting of their own families, wherever this is practicable.

In the tremendous increase in hospital deliveries we are finding both problems and opportunities. The problems seem to center around the quality and quantity of available medical care: problems which may be accentuated in the light of our increasing birth rate.

But in the increasing interest in classes for expectant parents, evidenced all over the country, we have an opportunity to lay the groundwork for the promotion of mental health in families.

Information from the first revised maternal and child health report now coming into the Bureau shows that the increase in the number

of mothers and children receiving service under these programs continues. Three facts stand out:

- Some 10½ million children received the Salk vaccine under maternal and child health programs in 1956.

- Last year 2½ million children received audiometric testing. This is the first time we have information on the number of children tested under these programs.

- Some 296,000 children received medical services last year under the crippled children's program, an increase of 6 percent from the previous year. Congenital malformations continue to make up the largest group of diagnoses, representing almost a fourth of the total.

Last month, a group of radiologists, obstetricians, pediatricians, dentists, and public health workers met with the Bureau to advise with us on radiation hazards to mothers and children. Both this Association of State and Territorial Health Officers and the Association of Maternal and Child Health and Crippled Children's Directors were represented. The pediatricians and obstetricians attending this meeting reported that doctors in practice and in medical schools recognize the need to take positive steps to make sure that in its very proper role as a diagnostic tool, there is no excessive use of X-ray.

It seems equally important for us to examine our own practice in our clinics to be sure that routine does not become a larger consideration than the exercise of the physician's best clinical judgment in the use of X-ray.

Now, as to some of our related interests in which medical professional groups are devoting increasing attention:

For the eighth consecutive year, reports show a rise in juvenile delinquency which, percentage-wise, is faster than the increase in the juvenile population. Interest in State and local programs for the control and treatment of juvenile delinquency continues at a high level. Several States have established new services, and a number have either proposed or passed legislation which provides for changes in State structure to permit establishing separate agencies or divisions to administer services to delinquent children.

There is also considerable activity in the establishment of new or reactivation of old State and local committees or commissions for communication, joint planning, and coordination of services and activities in relation to juvenile delinquency. Forestry camps have already been established in at least 10 States, with 5 others planning to establish such camps.

Maternal and child health services can be a strategic point for preventive efforts in juvenile delinquency. Studies show that some children at the ages of 9 or 10 manifest pre-delinquent behavior which could be noted in a good school health program.

As Norman Lourie has said, "We are aware that the so-called delinquent youngster . . . must have been deprived of something terribly important to him as a human being if, in order to be at peace with himself, he has to be at war with society." Strengthening family relationships during the earliest stages of the child's development could perhaps do much to offset this kind of deprivation. Well-baby clinics offer the natural setting for the discussion and strengthening of the developing mother-child relationship.

We must recognize that, among the young in our population, the adolescent is a neglected figure from a health standpoint. We have concentrated our concern for children on infants and very young children, and much useful knowledge has been developed for them which is in effective use.

It seems to me that we must increasingly adapt our health programs to take into consideration the concerns of adolescent youth which are not similar to those of younger children, and are not yet adult concerns. Adolescents have characteristics peculiar to themselves.

We need to give thought to how we are caring for adolescents in our hospitals, and whether the guidance clinics which are available to meet their anxieties, both real and fantasied, are truly responsive to their needs.

In our school health programs, we need to assure the adolescent adequate counseling on health problems rather than relegate the student's contact with that service solely to an examination for athletic participation.

In many instances, the problem of obesity in adolescence is being treated as a part of the

young boy or girl's "growing pains," when, in reality, it may be the starting point for a life pattern which can best be checked when first observed.

It is unfortunate that so much of the attention we direct toward the adolescent age group today is in the form of concern for those adolescents who are delinquent. I think we need to be concerned with adolescents as an age group with health and psychological problems, problems of finding their way in the world.

One of the greatest challenges we face today is helping teen-agers find their place in this changing world. I have implicit faith in the parents of this country, who are trying to do a good job in preparing their children for tomorrow's world. I am sure they will welcome any assistance that we in the helping professions can give them in making that preparation adequate for the testing days ahead.

Trends in Child Welfare

In child welfare programs, points of view are changing and experimentation is taking place in the use of foster care. Specialized foster family homes are being tried for children formerly believed to require institutional care. The present trend in institutional care is away from large institutions for neglected and dependent children and toward small group homes to meet special needs of emotionally disturbed children and of adolescents who are not able to assume closer foster family ties.

The Children's Bureau for the past 2 years has employed a special consultant concentrating on unprotected adoptions. Any examination of the reason for these adoptions—black market sale of babies, gray market or other independent placements—points to the lack of adequate care for unmarried mothers. This lack seems more acute since the rate of illegitimate births is steadily rising and the mothers are increasingly younger. A large number are only 14 or 15 years old.

In 1957 and 1958, our special consultant has been working to find ways to bring doctors, lawyers, and social workers together, in planning for more adequate services for unmarried mothers and in identifying the respective roles of these professions in adoptive placement.

Work on the statement on the role of the social worker in adoption is well under way.

A statement of the doctor's role, adequately publicized by medical groups, could be an enormous help in clarifying the attitude and the activities of physicians who place babies today.

We plan to seek the help also of lawyers in developing the third part of this total picture of professional services in adoption.

The Children's Bureau has long had an active interest in homemaker service as a way of maintaining family living in times of crisis. As the result of a meeting called by the Children's Bureau in June 1956 persons interested in homemaker service recommended that a conference be held this year.

However, interest in this service is so great, and it has such wide application to problems such as care of the aged and chronically ill, as well as to children, that our original plans have expanded to include other governmental agencies and many national voluntary and public health and welfare organizations. The anticipated conference will be on homemaker and related services.

Working on planning for this conference is a steering committee with membership from the Children's Bureau, Bureau of Public Assistance, Bureau of Old-Age and Survivors Insurance, Office of Vocational Rehabilitation, Office of Education, and Public Health Service. The conference is now planned for late in 1958.

The problems of migrants continue to cause us concern. All of us in the Federal Government wish we had more facts, rather than guesses—just such simple things as counts on the number who migrate, on the number of children who go along, whether or not they get into school, are immunized, and get needed social services. The special projects in Colorado and Florida have flourished and must be a source of pride to the health personnel. We are especially encouraged by the initiative that the New York regional office of this Department has shown in getting people from States in the region together on a regular basis to exchange knowledge on activities and ideas. Plans are now under way, we understand, for a joint meeting between Region II and Region III to exchange views on common problems.

Dr. Eliot has always reported to you on the work of the United Nation's Children's Fund. In September, I had the privilege of serving as principal adviser on the United States delegation to the Executive Board of the United Nations Children's Fund, and of seeing Dr. Eliot in action. The tributes paid her at this final session after her long years of devoted service show how greatly she will be missed as the United States representative.

At the September session of the board, allocations of \$12 million were made to 80 projects in 53 countries or territories, bringing the total allocation for all purposes for 1957 to more than \$24 million. Disease control is the largest area of expenditure, with malaria at the top with \$8 million.

In recognition of the tradition of services of a high quality which have always distinguished the programs carried forward through the joint efforts of the Bureau and the State health departments, I hope in the years ahead we can continue to move forward with vigor in our role of helping the disadvantaged, of pressing for preventive measures, in continuing to enlighten the public in times which are constantly changing.

Social Security And Public Health

By W. L. Mitchell
Acting Commissioner
Social Security Administration

The Social Security Administration has been given jobs to do through congressional action that have important public health implications. As illustrative of the extent to which the Social Security Administration is already involved in health programs, approximately \$370 million was identifiable in 1956 as public assistance expenditures for medical care. Almost \$10 billion was paid out under our social security program, an aggregate that can be said to have public health implications if for no other reason than that personal well-being is inseparable from public health.

Payments under the old-age, survivors, and disability program are now at an annual rate of close to \$7 billion, and the number of beneficiaries has passed the 10.5 million mark. About 5.3 million people are receiving assistance totaling some \$2.8 billion a year under the four federally aided programs.

We in the Social Security Administration have been increasingly concerned about the interrelation of the service and income-maintenance aspects of our programs, and we share that concern with people in public health. Last year's amendments strengthened the welfare service aspects of the public assistance programs and helped the States to increase their medical programs. The effectiveness of the insurance program in meeting basic economic needs depends in many ways on the extent to which the community provides needed health, welfare, and related services, especially those which increase an individual's capacity for self-help and self-care. If the beneficiary is able to manage without major expenditures for special care, his benefit can more adequately cover basic costs of food, clothing, and shelter.

Since economic well-being is inseparable from social well-being, and since the dividing line between peace of mind and physical health is slight indeed, these programs cannot help but have tremendous impact on the health of all our people.

New Developments

Last year, Congress amended the old-age and survivors insurance program to provide cash benefits for severely disabled insured workers between the ages of 50 and 65. Earlier, in 1954, provisions had been enacted to freeze the benefit rights of workers who are totally disabled for long periods during their normal working lifetime. Well over half a million freeze applications have already been received. With cash benefits first payable for July 1957, it is estimated that about a quarter of a million persons aged 50-64 will be awarded benefits in the first year of operation. Disability benefits to be paid in calendar year 1958 are estimated at about one-quarter billion dollars. These benefits are paid out of a separate trust fund financed through a tax increase on employees, employers, and the self-employed.

To qualify for disability insurance benefits or for a disability freeze, it must be established that the insured worker has a physical or mental impairment that is so severe it keeps him from engaging in any substantial gainful activity. It must be the kind of physical or mental condition that shows up in the medical evidence, including the doctor's report, hospital reports, or special tests, and it must have lasted for at least 6 months and be expected to continue for a long and indefinite time.

The determination of disability is made by a State agency, usually the vocational rehabilitation agency, under an agreement between that agency and the Federal Government. The State agency staff, a medical consultant, and a lay adjudicator, usually with rehabilitation experience, make the determination on the basis of medical evidence and such personal and vocational factors as age, education, and work experience.

Health officers may be interested in some statistics from the operations of the disability provisions of the program. Of the cases adjudicated for benefits or a freeze in 1956, 85 percent were male. The median age of allowed applicants was 58.1 years and almost 65 percent were ages 50-64. In half the cases, the disabling illness had lasted 4 years or longer. Of all applicants allowed during 1956, 57 percent were in institutions or confined to their homes, and an additional 6.5 percent required help to get about outside their homes. These figures reflect the early adoption of procedures to identify severely disabled people. Institutional and home-bound cases were quickly identified and, as a result, were filed promptly.

Four classes of diseases accounted for more than three-quarters of the cases allowed in 1956: diseases of the circulatory system, including heart disease, about one-fourth; diseases of the nervous system and sense organs, about one-fourth; mental, psychosomatic, and personality disorders, about one-fifth; infectious and parasitic diseases, including tuberculosis, about one-eighth.

Through the 1956 amendments, Congress also extended benefits to the disabled child over 18 of a retired or deceased insured worker, provided the child had been totally disabled before age 18. It is estimated that about 35,000 dis-

abled children will be added to the benefit rolls in the first year. A surprising number of these children had been disabled for many years and were completely unknown to the community. In some cases, the filing of a claim for benefits may be the means of making the parent or guardian aware that resources are available to help this child to a more normal life. Thus the new benefit has significance beyond the mere provision of income support for adult children whose disabilities make them dependent.

Physicians and Disability Provisions

A practicing physician, serving on a part-time basis, is frequently the medical member of the State agency evaluation team that makes the determination of disability.

The family doctor who has attended the claimant is also closely involved. The disabled person, applying at his social security office for benefits or to have his record frozen, is responsible for getting the medical evidence needed to show the extent and duration of his impairment. Most of these individuals have had some medical attention and will ask their attending physicians to supply medical reports on their conditions. Others may take the report form to the clinic, hospital, institution, or agency where they have received treatment. While the medical report form was designed for the convenience of the physician, it is not required that he use this form; a narrative summary or photocopies of pertinent records are acceptable.

Mental institutions, sanatoriums, and hospitals for the aged and chronically ill have received more requests to complete medical reports than have general hospitals since a higher proportion of their patients qualify under the disability provisions. We fully appreciate that completing a multiplicity of forms creates an unusual burden on these institutions. We believe that they will be relieved of much of the problem when disabilities that had their onset a considerable time prior to application no longer form such a high proportion of the workload. For purposes of the disability freeze, applications have been accepted from individuals whose disabilities began as early as 1941. In these cases it is usually quite dif-

difficult to reconstruct reliable records. After June 1958, a period of disability cannot be established beginning earlier than 1 year from the date of the application.

One of our problems is to dispel some of the misconceptions that attending physicians have about their role in the disability process. Many doctors feel, and I suppose with considerable justification, that they should be reimbursed for the cost of preparing the medical report. We fully appreciate the feelings of physicians who ask for a fee when it is obvious from the patient's attitude that he does not expect to pay for the service. But, as a matter of policy, we require the applicant at his own expense to furnish us with records which reasonably support his claim.

Other doctors are perturbed when asked to complete medical reports for individuals whom they have not seen for many years. We seem to have great difficulty in getting over to them that the report requested is not intended to portray the present medical condition but relates to the medical condition at the time the physician last examined the individual.

In many cases, the medical evidence submitted is inadequate, and it is necessary to write back to the reporting physician. Many doctors believe that a simple statement of diagnosis, prognosis, and opinion as to the degree of disability is the type of information required. Actually, the determination of disability is made principally on the basis of clinical and laboratory findings. The applicant's doctor is not asked to make a determination of disability. We ask only for complete enough clinical information to allow a reviewing physician to evaluate effectively the incapacity and the probable future course of the condition.

The law requires that all disability applicants be referred promptly for State vocational rehabilitation services. Insofar as possible, the process of determining disability is geared to provide facts about the person's impairment and residual capacities that are also useful in identifying the kinds of services needed for rehabilitation.

By July 1957, 400,000 applicants had been referred. Case disposition reports had been re-

ceived in 140,000 cases. These reports show that only 7 percent of the applicants had enough potential for rehabilitation to be accepted for services. Since a very large proportion of the persons referred were in the older age group and suffered from serious and long-standing disabilities, we could hardly expect to find many vocational rehabilitation prospects among them. As the backlog of long-standing disability cases is eliminated and as the more recently disabled come to form a higher proportion of applicants to the Bureau of Old-Age and Survivors Insurance and, thus, of Bureau referrals, we may expect the practical effectiveness of the referral program to be greater than indicated by the data now available.

An immediate problem, however, is how the vocationally unrehabilitatable can be helped to realize their maximum potential for self-care and a satisfying life. Here is an area where much might be done through demonstration projects of services to disabled beneficiaries, perhaps with a State health agency assuming responsibility for the organization of the special services needed.

Public Assistance Medical Care

There exists a great variety of methods of providing medical care to recipients of public assistance. The methods differ not only from State to State but among the localities within the same State. Medical care for this group has been traditionally a local responsibility, but such responsibility is gradually being supplanted or supplemented by State programs and, to a lesser degree, by Federal grants-in-aid to the States. The Federal grant, by requiring statewide participation, is undoubtedly a factor in the extension and improvement of provisions for medical services to needy people.

Federal participation in the financing of medical care has, however, been very modest. While public assistance costs, including general assistance, are presently running at the rate of about \$3 billion annually, only about 9 percent of the total in calendar year 1956—\$269 million—was in the form of vendor payments made directly to hospitals, doctors, druggists, nursing homes, insurance companies, and so on. Of the total vendor payments, less than one-fifth was made from Federal funds. An-

other \$100 million was included in the money, or so-called cash, payment to recipients to give them funds to pay for medical care; perhaps as much as three-fifths of this amount came from Federal funds.

A large part of all vendor payments has been concentrated in a few States. Of the vendor payments made for the aged in June 1957, half were in New York, Illinois, and Massachusetts.

Until July 1957, Federal participation in medical care for public assistance recipients has been subject to an individual monthly maximum (currently \$60 for adults) which determined the Federal share of both maintenance payments and medical care. In 1956, Congress provided separate matching for medical care on an average basis. The average monthly amount in which the Federal Government will share on a fifty-fifty basis was set at \$6 for every adult and \$3 for every child on the assistance rolls.

Following the 1956 medical care amendment, 13 States have for the first time submitted plans as a basis for claiming Federal participation in the medical care payments in one or more categories of public assistance. In other States which have had established medical care programs, the ratio of medical care costs to total public assistance is rising.

The States that are now moving into medical care for recipients of assistance are those with the least economic resources. They, more than States with well-established programs, must examine their plans most carefully. These States especially need professional help in planning how best to spend an amount that is recognizably inadequate for the job to be done.

It appears that an ever larger portion of the dollar for public assistance will be spent for medical care. With the social insurance program carrying the burden of income support, public assistance will be increasingly concentrated on people with heavy medical needs.

Let us turn now to another development in which health and welfare people are jointly concerned: the possibility of restoring former mental patients to normal living arrangements after institutional care is no longer indicated. No one would argue about the desirability of arrangements that make it possible for such people, many of whom have spent most of their years in institutions, to participate again in a

normal life. But I think we should recognize that the joint efforts of our health departments and our welfare departments in making such arrangements may run into financial barriers involving total cost and how the cost is shared. The costs involved in returning a former patient to the community frequently include costs of basic income support to be provided through the Federal-State program of public assistance and always include costs of services for finding a suitable place to live and to adjust to a new way of life. In the long run, these costs may be no greater than costs of good institutional care. But their financial impact is different. Whereas the State budget had carried the full cost of the institutional care, the locality may now be called on to share costs, at least for services. And while the total cost borne by the State and its localities may be lower because of Federal participation in public assistance, the mere fact that some local financing is involved can prove an almost insuperable barrier.

Nursing home care constitutes another area in which we have a strong mutual concern. In the recent study of nursing homes in 13 States which the Public Health Service made jointly with the Commission on Chronic Illness, it was found that fully half of all proprietary nursing home residents were recipients of public assistance. Furthermore, assistance funds were paying the full bill in 4 out of 5 of these cases. In most of the States the average payment made to the nursing homes in behalf of recipients of public assistance was considerably below the private-pay average. This highlights a very difficult situation—the problem of financing nursing home care by public assistance at rates that will buy really good care.

Some welfare agencies have already recognized that it may cost less in the long run to pay nursing home charges that include restorative and rehabilitation services than to pay, over a much longer period of time, charges for care that merely permits the patient to live out his days in bed. The new public assistance provisions for medical care may make such financing increasingly feasible.

The welfare field must rely on the public health field for a large part of the task of seeing that these nursing homes are safe and sanitary and for improving their standards so that they

are more than mere depositories for human beings. Skilled nursing services, restorative activities, and adequate medical supervision are minimums which are sadly lacking in some of these establishments.

I feel that I speak for public welfare people in general when I say that public welfare agencies have no desire to become medical agencies. We believe that the department which is under medical auspices should have an important voice in developing the medical aspects of social insurance and welfare programs. We who are concerned with the social security programs are ready, eager, and willing to cement our partnership with those in the public health field. Through a truly cooperative endeavor, the competency of each can be brought together for the general well-being of our total population.

Charting the Growth Of Radiation Hygiene

**By Russell Morgan, M.D.
Special Consultant on Public
Health Aspects of Radiation
Public Health Service**

Public exposure to radiation is becoming a major concern of health agencies.

The major users of radiation may be categorized as medical, industrial, agricultural, governmental, and military.

The major sources of radiation may be classified as X-ray machines; other particle accelerators such as the betatron, which is coming to have increasing industrial application; natural sources, including radium and radon; radionuclides that have been produced or concentrated by the hand of man; nuclear reactors, including their fuels and wastes; and weapons.

The biological effect of radiation that has attracted particular attention in recent months is genetic, that is the disruption of chromosome material. Not only are damaged chromosomes in germ cells productive of changes in the future generation, but changes in the chromosomes of somatic cells are productive of

changes in tissues in the present generation. Such somatic effects may be cancerous in character. There is no question that radiation is related to the incidence of leukemia. And its life-shortening effects seem to be well indicated, if not precisely known.

The immediate task is to place radiation hazards in perspective in the total enterprise of public health. Studies have begun toward this end, and the information available is not all that could be desired to organize firm conclusions. Nevertheless, preliminary figures provide some basis of comparison between radiation injury and such disease entities as poliomyelitis, tuberculosis, heart disease, and mental illness.

It appears that, unless the present trend in gonadal exposure to radiation is checked, genetic injury may be expected to produce more deformities in future generations than have been suffered from anterior poliomyelitis. The health burden of radiation injury at present is roughly in the same order of magnitude as the burden of tuberculosis. In 5 to 15 years, unless adequate safeguards are instituted, the health burden of radiation injury may be close to that of heart disease. Radiation is unlikely to be as much of a burden on the health and economy as mental illness. But radiation hygiene will be significantly and substantially more important in public health practice in the next few years.

What programs may health agencies be expected to develop for radiation hygiene? The foremost need is for research in both fundamental and in applied radiobiology. Such research is needed to bolster standards of radiation safety. It is no secret that the maximum permissible dose limits that have been recommended are arbitrary judgments, based upon assumptions no less than upon facts. And only effective research can supply the facts to replace assumptions as the basis for reasonable, intelligent, and practical measures of radiation safety.

It is also important to develop a general understanding of the public health significance of the increasing number of radiation sources. Although excellent work has been done to explain the physics, the engineering, and the functional aspects of radiation, little has been done

to stimulate education in public health aspects of radiation. Such education, training, and experience is of course basic to the application of a program of radiation hygiene.

With respect to the regulatory aspects of such a program, it is a sound policy, accepted in most political institutions, that the agency which promotes an activity should be separate from the agency which inspects and polices that activity. For example, there is a current public conflict between the interest, economic and administrative, of promoting the construction of power reactors near centers of population, and the interest of public health. It is a responsibility of health agencies to protect the public health interest with respect to such projects.

Health agencies inclined to work on radiation hygiene are not necessarily at a loss for qualified counsel. In many universities there are men who have sufficient acquaintance with the physics and biology of radiation to provide the health official with guidance. A first step for a health department might be to prepare an inventory of people who are qualified and willing to help in these decisions. Another step is to develop an inventory of radiation sources within the agency's jurisdiction. And the surveillance of these sources will permit the agency to determine what needs to be done.

Progress Report on Air Pollution

By Vernon G. MacKenzie, B.S.

**Assistant Chief, Research and Development
Division of Sanitary Engineering Services
Public Health Service**

Air pollution, in its modern form, may be taken as a prime example of newly developing public health problems associated with increased urbanization, intensified industrial activity, greater use of transportation, fuel usages, and refuse disposal practices. Activities of this kind, connected as they are with modern urban living and a higher standard of living, are essential and beneficial to organized society; the problems they create, therefore, are strikingly

characterized by the fact that they are not solely detrimental to public health. And, too, unlike the older problems of communicable diseases, these new problems cannot be "stamped out." They must, however, be controlled and kept within safe bounds.

Several factors contribute to the increased complexity of the air pollution problem: changes in fuel usages, increased per capita use of energy, and increased per capita consumption of materials. A revolution in fuel usage has occurred in the last half century. In 1900, 90 percent of the fuel energy in the United States came from solid fuels; today, 70 percent comes from liquid and gaseous fuels. Equally striking has been the huge amount of energy made available to us, and the greater per capita use of raw materials and of finished products from them. Visible smoke pollution problems, which could be abated by relatively simple measures, have been superseded by the more complex problems of contamination by gases, vapors, and miscellaneous particulate emissions.

Air pollution problems are widespread throughout the United States. One survey has estimated that 10,000 communities in this country are affected by air pollution. The magnitude of local problems ranges from contamination produced by a single factory stack to "smogs" spreading and mixing over entire metropolitan areas.

Evidence of damage to livestock, vegetation, and physical structures by various air pollutants is reasonably well documented, although incompletely understood. Economic losses from such causes have been estimated at more than \$1.5 billion per year.

Equally well documented is the fact that air pollution can cause personal discomfort, such as eye and respiratory irritations, or even human illness and death under conditions unfavorable to the atmospheric dilution and dispersion of contaminants. Of perhaps equal public and professional concern, although without documentation, has been the potential long-range effect of pollutants on human health. Although the evidence of causative relationships between specific atmospheric contaminants and the effects upon humans is incomplete, the intensity of pollution has impelled undertaking air pollution controls in many areas even in the absence

of knowledge on specific etiological relationships.

Air Pollution and the Law

Local ordinances for the control of air pollution have long been a part of American government. The first smoke-control laws were adopted by Chicago and Cincinnati in 1881. Comprehensive control of air contaminants, however, is a recent development. The major impetus in the enactment of air pollution control legislation has come since World War II. In a recent study, it was found that more than 80 percent of the ordinances of 110 cities, representative of various population sizes, have been enacted within the last 15 years. Further evidence of the growth of local programs is afforded by the Directories of Governmental Air Pollution Agencies published in 1955 and 1957, the number of local agencies listed increasing from 115 to 279 in the 2-year period.

On the State level there has long been a history of sporadic ad hoc activity of technical study in connection with specific air pollution problems, principally by State industrial hygiene organizations. Recently, however, there has been increasing interest in the organization of State programs explicitly authorized by statute. The first of these laws was passed in Oregon in 1951. It established an air pollution authority in the Oregon State Board of Health with powers to study and legally enforce all aspects of air pollution. Similarly comprehensive legislation in Massachusetts and New Jersey followed in 1954. A State air pollution program was authorized in California in 1955 and in 1957 in seven additional States (Colorado, Delaware, Florida, Minnesota, New York, Ohio, and Washington) and the Territory of Hawaii.

The circumstances contributing to the enactments differ from State to State, resulting in considerable variation in the laws, and there has been but little operating experience under them. Several features of these laws, however, deserve mention:

1. All of the laws would apparently authorize studies and technical assistance for local problems.
2. Ten of the twelve enactments extend coverage to all air pollution problems; two would

restrict the authority to instances detrimental to public health.

3. Eight of the twelve laws provide for some legal control of air pollution on a State level.

4. In every instance, the State health department is named as the operating agency; in five instances, a board, commission, or authority is also established with interests other than health represented.

Only one legislative step has been taken in relation to an interstate air pollution problem. Under legislative authority enacted by the States of New Jersey, New York, and Connecticut, and ratified by Congress in 1956, the Interstate Sanitation Commission is studying the interstate problem in the New York-New Jersey area and will report to the legislatures of these two States.

If there is any lesson to learn from the history of State and local air pollution control legislation to date, it is that the individual law or ordinance should be tailored to the situation and take into consideration the varying circumstances and needs of the jurisdiction involved.

Public Health Service Program

The Public Health Service program on air pollution, authorized by the 1955 act, is now in its third year. The act authorized a 5-year program of research and technical assistance at a maximum annual cost not to exceed \$5 million. It specifically reserved to the States and local governments the responsibility for legal control of air pollutants. Approximately \$8.5 million has now been appropriated under the act, \$1.75 million in 1956, \$2.75 million in 1957, and \$4 million in 1958.

The major emphasis in the program is on research. Approximately 80 percent of the resources are devoted to this purpose, and the remaining 20 percent are used for training and technical assistance on specific problems. From another viewpoint, approximately 60 percent of the available budgetary resources are devoted to physical science and engineering control studies and 40 percent to studies on the effects of pollutants on health. From a third viewpoint, about 45 percent of the program resources are used for intramural Public Health Service activities, with the remain-

der divided about equally between outside grant and contract studies. All grants and contracts are on a project basis; the act does not authorize general support or formula-type grants.

Although much of the research is necessarily of long-term character, some results are already appearing in reports and publications concerned with the identification and measurement of pollutants in the atmosphere, the factors affecting the behavior and dispersal of pollutants in the atmosphere, the effects of air pollutants, and means for their abatement.

Work under way on improved methods of analysis has led to a promising development for continuous monitoring of fluorides and an improved smoke inspection guide for use by local authorities. Other areas in which progress is being made include tracing pollutants to specific sources, filter fabrics for high temperature gas streams, and improved design for refuse incinerators.

The lack of basic data on the nature of air pollution has led to the creation of the National Air Sampling Network covering 110 urban and 25 non-urban sites. This network, operated in cooperation with States and communities, may provide data on air pollution which can be correlated with geographic, demographic, meteorologic, and other variables.

That part of the program concerned with the effects of air pollution on human health has initiated toxicological studies to determine the effects of pollutants on animals and biological systems, and clinical and epidemiological studies to determine the effects on human beings. The compilation and publication of mortality data by cause of death for 163 metropolitan areas have provided an important working tool for use in this and other fields of study. Another example of medical research recently initiated is a study undertaken in cooperation with the National Cancer Institute and the University of Southern California on the carcinogenicity of aliphatic and aromatic fractions of air pollution samples collected in eight metropolitan areas through the National Air Sampling Network.

In the 2 years since the initiation of the air pollution program, several hundred requests for technical assistance on general and specific air pollution problems have been received from

State and local government agencies and other organizations. The assistance provided by the Service has depended, of course, on the resources available and has varied from limited consultation to assigning personnel to work cooperatively with State and local agencies.

Staff members have been assigned to studies in the States of Connecticut, Washington, California, and Tennessee, and in Louisville, New York, Los Angeles, Philadelphia, and other areas. The cooperative State surveys which have been made in Connecticut, Washington, and Tennessee have, I believe, demonstrated a means of appraising the statewide air pollution problem at reasonable cost.

In addition to the direct technical assistance activities of the Service, demonstration project grants have been provided for study of local and regional problems. Such grants have been made to the State health departments of California, Colorado, Illinois, and Indiana, to the city-county health unit of El Paso, Tex., the Interstate Sanitation Commission, and Oregon State College. Other demonstration project grant applications are pending.

To assist in the alleviation of the shortage of technical personnel trained in air pollution research or control, the Service has been conducting short-term training courses at the Robert A. Taft Sanitary Engineering Center in Cincinnati; more than 500 trainees attended the training courses during the last fiscal year. In addition, the Service has made grants to 10 universities distributed across the country for initial development and support of graduate level curriculums, and for a limited number of traineeships.

With 2 years of the program completed, a considerable volume of results from the various studies undertaken are beginning to flow in. The Service hopes to make this information available at the earliest feasible date. Consequently, a more formal system will shortly be inaugurated for disseminating information derived from the Service's direct air pollution studies and from grants and contracts which it is supporting. Reports of a general nature together with lists of projects undertaken and other reports, publications, bibliographies, conference proceedings, and similar informational material will be available shortly.

COMMUNITY HEALTH SERVICES

At one of the conference sessions, three local health officers described activities illustrative of the theme "developing new local health department programs within existing community organization." Their papers follow.

Rehabilitation In San Mateo

By Harold D. Chope, M.D., Dr.P.H.

Director of the Department of

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San Mateo County, Calif.

Within the last 3 years, a forgotten part of the California county of San Mateo has been found, and what was to many a life without hope has become a life with purpose and dignity. The story that I tell, however, is not just of a few disinherited individuals who were provided for, but of an entire county that became involved with the problems and satisfactions of rehabilitation. For, upon a foundation of resourceful social and public health workers, community interest accumulated to form a bridge upon which all might walk.

San Mateo County is relatively small, covering 448 square miles on the San Francisco peninsula. It is bounded on the east by San Francisco Bay, on the west by the Pacific Ocean, on the north by the city and county of San Francisco, and on the south by Santa Clara and Santa Cruz Counties. The county is split down the middle by a range of hills which protects the eastern slope of the county from the chilling winds of the Pacific, and it is here that the population is most dense. On the western slopes are the sleepy little towns of Half Moon Bay and Pescadero, still supporting a way of life with fishing, cattle, and truck gardening not much different from the early days.

The people who live in San Mateo are young (the median age is 31.4 years), relatively well

educated, and have an income that averages \$1,400 higher than the United States as a whole. They form a community which in recent times has become increasingly urban, with light industry and decentralized shopping centers burgeoning about them.

The San Mateo Department of Public Health and Welfare, first established in 1932, is now organized into five basic divisions: administration, recently added to the department; public health; social service; county hospital, including outpatient and psychiatric facilities; and the tuberculosis sanatorium. The social service division operates two institutions, a 17-bed home for dependent and neglected children and the 135-bed Crystal Springs Rehabilitation Center.

The most extensive reorganization of the department has taken place since 1948 as a result of a complete survey ordered by the board of supervisors.

In 1948 the county faced many problems. World War II had prevented not only the normal increments in a building program but had made impossible the development of physical facilities to serve the rapidly growing population. While the department had many excellent employees, there was need for more employees, considerable reorganization, and the recruitment of new leaders in some disciplines. Much time during the first 4 years (1948-52) of the present administration was spent in construction, recruitment, and reorganization. The new addition to the Crystal Springs Home was completed in 1949. An entirely new 120-bed tuberculosis hospital was dedicated on March 2, 1952. A bond issue to enlarge the county hospital was approved by the voters in November 1952, and the addition was completed at the end of 1956. In 1953 the health and wel-

fare divisions moved out of the basement of the courthouse into a new 50,000-square-foot administration building on the hospital site.

Rehabilitation Begins

During this period there was considerable fomentation regarding rehabilitation, much of the stimulation coming from Dr. Lester Breslow, chief of the bureau of chronic diseases of the California State Health Department, but nothing that could be delineated as a formal rehabilitation program. While there was much reviewing of current articles, conferring, and verbalizing about rehabilitation, this amounted to little more than the fertilization of the soil in which our now beginning program was to grow.

I think that at this point it is only fair to point out that, while the desire for a rehabilitation program existed with the medical administrative personnel of the department, and various specialties in medicine have made major contributions, the real leadership came from the social work discipline.

Until February 1954, the Crystal Springs Home had been operated as a "relief home," with the "inmates" receiving "custodial care for elderly indigents." Adrian Ward, superintendent of the social service division at that time, recommended as the new manager Einar Nordby, a man with broad experience in social work. Mr. Nordby brought to his new job more than good training and broad experience; he brought two other characteristics of inestimable value: a strong conviction about the values of rehabilitation and an abiding faith in the infinite capacity of human beings to overcome seemingly insuperable handicaps and, I might add, a sincere respect for human dignity. Within a few weeks, the "relief home" had become the "Crystal Springs Rehabilitation Center," the "inmates," "patients," and "custodial care for elderly indigents" became "rehabilitation treatment services for patients with long-term illness."

While it did not take long to change names and terms, it took a little longer to develop the program and philosophy indicated by these terms and to teach a largely untrained staff to center their efforts on restoring dignity, status,

self-respect, and self-esteem in the individual patient. The dietary was improved after a survey by the nutrition section of the State health department. Little things were initiated, such as arranging the mealtime to suit the patients rather than the staff, placing sugar and condiments on the table to afford patients free choice of seasoning, providing a before-bedtime snack of graham crackers and milk, consulting patients on their likes and dislikes, and serving food as attractively as possible instead of prison style. None of these things alone had too much significance, but each indicated to the patients that the management considered them humans capable of personal decisions, with opinions of value in determining policy.

A second method of providing motivation to the patients was to form committees to discuss policy and program—a library committee, an occupational therapy committee, a patient's service committee. Budgetary limitations did not permit the employment of additional staff the first year of operation, so the manager and the committees turned to the community for volunteer help. The relief home had been shunned by the community, except for a few stalwart church groups and people "wanting to do something for the poor" during the holidays. But with the new spirit, which is hard to describe but was immediately felt, community organizations, service clubs, church groups, women's clubs, and others became enthusiastic sponsors of various rehabilitation activities, providing materials, tools and money, and finding qualified volunteer arts and crafts teachers. The patients exhibited their handiwork at the annual fiesta (county fair); they organized an annual bazaar and started a monthly newspaper.

These activities gave status and helped restore sadly depleted self-esteem. The "inmates" were again human beings with personalities and skills. These activities gave new hope and incentive, but this was not enough. The physically disabled were still disabled though their outlook had improved. The mildly depressed responded well, but the severely depressed were still depressed. Again volunteers were recruited—a psychiatrist, a half-time physical therapist, social workers in the evenings after their regular day's work.

Time does not permit a step-by-step development of the program through the next 2 years, but the demonstrated accomplishments convinced the board of supervisors, and we started fiscal year 1958 with a fairly adequate professional staff consisting of a part-time psychiatrist, a full-time psychiatric social worker, a part-time medical physiatrist, 2 physical therapists, 1 full-time and 1 half-time occupational therapist, 2 part-time internists, a part-time vocational counselor, a full-time dietitian, and a nursing director with a master's degree, experienced in care of the chronically ill.

What has this type of service cost the taxpayers of the county? Do the results justify the added expenditure?

The indigent custodial care, consisting of food, shelter, and minimal medical care, cost the county \$4.96 per patient-day for the fiscal year 1953-54. In the year 1954-55 the cost increased 54 cents per patient-day to \$5.50. In 1955-56 the cost went up another 50 cents to \$6 per patient-day, and in 1956-57 it rose to \$7.55 per patient-day. This represents a \$2.59 increase over the \$4.96 of 1953-54, or a 52 percent increase in costs. The cost increase is not all chargeable to rehabilitation. Increases in salaries, enlarging the nursing staff, rising costs of operation, and conversion of custodial beds to treatment beds account for most of it. The actual salaries for the professional staff associated with the rehabilitation program and the supplies and equipment amount to 45 cents per patient-day.

What did the county get for this? During the year 1956-57, 12 patients were restored to full-time employment, relieving the county of all financial responsibility ($12 \times \$2,756 = \$33,072$), and 41 patients were returned to private living in the community at far less cost than institutional care, a net saving of \$69,790.

These figures and calculations have value in budget analysis, but to me they are not the important results of a rehabilitation program. What criteria do we have to measure social value? What is the worth of human dignity to the individual? What is a new lease on life worth to a man who was totally defeated and contemplating suicide? What is it worth to his wife and family? What is the money value on the extension to 1 year or 10 years of active, in-

dependent, and productive living of a man who at 55 was rejected and disabled and felt discarded by society? Can society afford to rescue a woman of 70 from the living death of permanent bed rest with attendant evils of premature senility and retrogression to infantilism?

Subjectively, I am much happier to be responsible for an institution around which the community rallies, with the garden club planning landscaping projects, the cosmetologist association helping start beauty parlors, and church groups providing spiritual counseling, than to be responsible for the operation of a "poorhouse."

Broadening the Program

While the tangible and intangible rewards of expanded institutional care were many, there was still much to be done for those outside the institutions: the recipients of general assistance. Again we called on our State health department for a study to review programs and outline the needs for medical social workers. In September 1954 we established a medical social work service.

A study of the general assistance recipients in the county revealed that about 58 percent were dependent because of alleged poor health. This seemed to be a serious indictment of a department which had available all of the modern facilities for prevention and treatment of physical illness.

Although many were receiving care in the outpatient clinics of the department, it was decided to employ an internist in February 1955 to give thorough physical examinations to public assistance recipients and to serve as liaison between the social workers and the outpatient staff.

In a review of the work, 16 months later in June 1956, it was found that 75 percent of the men examined fell into five diagnostic categories: chronic alcoholism, chronic pulmonary disease, hypertensive vascular disease, neurological disease, and orthopedic defects. The women presented a different picture: 40 percent had a diagnosis of psychoneurosis or psychosis, and 23 percent had no diagnosable disease. It was obvious that physical health alone was not a major cause for the recipient's dependency. With these findings we approached

our psychiatrists in the adult psychiatric clinic. They declined to participate on the basis that the volume of cases was too large for them to handle and that the recipients would be uncooperative and unamenable to therapy. Although not accepting the recipients for individual or group therapy, the psychiatrists did consult with the rehabilitation team.

In September 1955, a part-time vocational counselor started testing the recipients, and the team in a staff conference attempted to summarize all data on each recipient and to rate the recipient as to potentiality for rehabilitation according to five factors: motivation; physical condition; skills and abilities; personal adjustment, including intelligence; and social adjustment. Using a scale of A through E for rehabilitation potential, we found that exactly 50 percent of the patients studied had a rating sufficiently high (A, B, or C) to justify further efforts.

As we moved along in this study, we observed that some of the patients, although appearing to have rehabilitation potential, had suffered such a long series of tragic experiences and had endured these experiences for such a prolonged time that they had come to accept passively their dependency and disability role. Many had tried to get jobs and had been rebuffed or had failed so many times that they no longer had the courage to seek a job or the confidence that they could hold one if found. So in October 1956 we started a work experience program. This was not the kind of a program where the clerical worker is put to raking leaves or picking up beer cans in the public parks. After the vocational counselor had delineated the possible skills of the recipient, an effort was made to place him in one of the county departments for work experience or he was referred to the California State Department of Vocational Rehabilitation for training. Mechanics were put to work on the county cars; women with sewing skills, in the linen rooms of the institutions; and recipients with clerical skills, in the various offices of the county. This relatively sheltered and planned experience was sufficient in a surprising number of cases to convince the recipient that he was able to work productively, and many sought and obtained private employment.

Our most recent step, in August 1957, was to

establish an industrial rehabilitation workshop under the direction of a trained occupational therapist.

Our next anticipated step is the formation of a citizens committee with representatives of labor, management, civic groups, local government, and interested persons to see if we can further our rehabilitation process.

Implications for Others

State and Territorial health officers might well ask, "What has all of this to do with our programs?" What has been reported is an isolated incident in an unusual type of administrative setup which exists only in this one small county in all of the United States.

But let me summarize the implications for State health officers implicit in this case report.

1. Specialized consultation (statistical studies, nutritional studies, and social service consultation) is available on the local level from State health departments.

2. If public health administration is to pursue vigorously the now accepted objectives of reducing chronic diseases and improving mental health, that segment of our population on welfare rolls presents a rich field for administrative study and the development of techniques.

3. Successful rehabilitation will not be accomplished by any single discipline but by a careful synthesis of the contribution of many professional disciplines: the psychiatrist, the social worker, the vocational counselor, the physician, including the specialist in psychiatry, and the administrator.

4. Results in rehabilitation may be accomplished by using the time-honored techniques of public health administration: careful delineation of a problem, selection of a specific segment for early efforts, locating, employing, and supporting well-trained staff, utilizing community resources, obtaining budget and financial support for the project, and keeping the community informed of progress. A local health officer does not need an administrative organization such as ours to further rehabilitation. A health officer, for example, in a county south of San Mateo has done an outstanding job with the traditional organization.

In the field of rehabilitation we should constantly keep in mind that beautifully confused metaphor of Charles Chapin: "It is not for me to 'set the river afire;' but there is many a great edifice builded of small stones."

Improving Patient Care In Nursing Homes

By Herbert R. Domke, M.D., M.P.H.
Commissioner of Health
St. Louis County, Mo.

Achieving improved care for nursing home residents requires coordination of many services, professional groups, and agencies, a function that is uniquely suited to the health department through its legal responsibilities for inspection and its pivotal position in the community.

As an inspection agency the health department can collect information on patient care and nursing home operation which may be a basis for developing programs.

As a formal unit of government, the department is in a favorable position in helping formulate proposed legislation.

Through its work with all nursing homes in a jurisdiction, the health department can help the nursing home operators, individually and as a group, develop professional understanding that can lead to improved techniques of patient care and other aspects of nursing home operation.

The health department, because of its relationships with other governmental and voluntary agencies, can foster varied community services related to patient care and adjustment. A special activity may be interpreting more accurately to the community the nursing home's role in meeting problems of the aged and chronically ill.

In Missouri, the St. Louis County Health Department, through its nursing home inspection program, acts as agent in enforcing State nursing home legislation in the county. From this basic service, the program has branched out into research, legislative, and training activities.

In comparison with national data the nursing homes in St. Louis County are reasonably typical. Data by age distribution, type of medical and nursing service needs, and financial support show that county homes and patients are in the median range for the United States. There are 15 nursing homes with less than 10 beds and several with more than 100 beds. The majority are privately operated; some are under church or other charitable sponsorship. The 60 homes in the county have a total bed capacity of more than 2,000, a larger number of homes and beds than would be expected for the St. Louis County's 600,000 population. The disproportionately large number is almost certainly the result of an enforcement code adopted by the city of St. Louis more than 30 years ago. The county had no licensing program until the State adopted its first nursing home legislation in 1941.

Legislative Action

The nursing home program, along with other aspects of chronic illness and aging, has received considerable attention in the community. Much of this program carries out recommendations made in a survey of chronic illness published by the St. Louis Social Planning Council in 1946. Also, in 1953 a Missouri nursing home association sponsored a bill designed to correct many obvious deficiencies of the 1941 law. However, the bill did not pass.

The health department began emphasizing the nursing home program early in 1954. At that time its official governing body, the St. Louis County Council, provided funds for establishing a chronic disease control section, partly to expand the existing, inadequate inspection. Acting on a recommendation of the Social Planning Council, the county council also authorized a survey of all nursing homes and their residents. The survey, utilizing the Commission on Chronic Illness forms, provided much new information.

Precise survey data pointed up defects and inadequacies of existing State legislation, further supporting the legislation sponsored by the nursing home association. In 1955, the association-sponsored bill, slightly modified, was reintroduced, and with broader backing

was approved by the State legislature. Unfortunately, the bill contained a provision which was held unconstitutional. In 1957, impelled by the disastrous nursing home fire in Warrenton, Mo., the legislature amended the licensing and regulation bill, which is now the basis for regulation.

The most controversial part of the present act provides for licensure by the type care the resident needs. The survey made by the Commission on Chronic Illness was especially valuable in supporting this provision because it showed a wide range of patient needs—from essentially boarding care to medical and nursing services at almost hospital level. For the first time in Missouri, it is possible to define minimum nursing home standards appropriate to a realistic appraisal of patient need.

Probably no one code can be a definitive answer to legislation and regulation, but this bill already has markedly improved patient care. Without the background of legislative review before the Warrenton fire, revised legislation would possibly have been restricted to fire safety provisions.

Survey of Nursing Home Residents

The Commission on Chronic Illness survey provides information about the resident's medical and nursing needs. Many other concerns, however, are expressed by the resident, his family, and the community.

Nursing home facilities continue to expand despite a general tendency to consider the home as an undesirable, last resort solution to the individual and family problem. Although there are some studies of psychological and social adjustment of the aged, including those in nursing homes, adequate information is not available on the factors important in placement and adjustment of the resident to the home. Certainly we had no such information in St. Louis County. More data were necessary to develop programs such as family counseling.

In 1955 a further special study of county nursing home residents became possible. Its purpose was to ascertain the circumstances leading to the use of the nursing home as a patient's way of living, the response of the patient to the solution of his problem, and any change that

might be made in him or his living arrangements that would restore or maintain him at his maximum level of functioning and happiness.

This study was jointly sponsored by the Chronic Disease Division of the Public Health Service, the Brown School of Social Work of Washington University, and the St. Louis County Health Department. General research policy was formulated by a committee of personnel from the three agencies. The school assumed responsibility for the execution of the project by its graduate students.

A sample of 36 residents from 23 different homes was selected for intensive interviewing. Residents interviewed were restricted to those who were clear of mind, had lived in the nursing home for a year or more, and had at least one close relative living in the St. Louis metropolitan area.

Detailed interviews of the resident, his relative, and the nursing home operator were conducted. Aside from the specific criteria of selection, analyses showed that the residents were essentially representative of the nursing home population when compared with the Commission of Chronic Illness data. Although the extensive interviews are a major asset, the small size of the sample can only represent a pilot study and the findings are not definitive. This unpublished study was compiled into one volume and presented as a joint master's degree thesis for many 1955 graduates of the school. The following discussion covers only a few of the factors studied and reported in the thesis.

The policy committee approached the study with certain preconceived ideas as to what it might find. Members thought many residents would totally dislike nursing home living, that relatives did not visit regularly, and that residents missed diversional activities. In this respect, the committee probably reflected the general community attitude toward nursing homes.

With due consideration for the small sample size, it is interesting and significant that these assumptions were not borne out. For example, 32 of the 36 residents, almost 90 percent, were found well adjusted on the basis of interviews with the resident, the relative, and the nursing home operator. Only 4 could be judged dissatisfied and had had a deteriorating course

of adjustment. Another set of data on psychological change in the patient after entry showed that approximately 1 out of 6 was improved, 1 of 5 was worse, and the remainder showed no change. Nursing home placement did not appear to have been generally deleterious for patients.

Although 8 of the 36 were entirely satisfied with their placement, and some of these 8 did not wish to return to a living arrangement with their families, the majority were only accepting of nursing home placement or had hopes, frequently unrealistic, of making other arrangements.

Data on Patient's Background

While these findings were certainly better than we anticipated, the background and expectations of the person who becomes a nursing home resident should be further evaluated. One surprising finding reflected in the favorable responses was that the women, who outnumbered men 4 to 1 in the sample, had had an unusual incidence of hardship as adults. Approximately 40 percent of the women had to assume complete financial responsibility for self and family at some time during their mature years, usually when they were widowed. This and other data indicated that the lower socioeconomic group in this community was more likely to select nursing home placement. Generally all the data pointed to the placement as an appropriate solution for the resident and his family.

Another finding was that the patient or family frequently did not consider a nursing home placement until shortly before the decision was made. Adequate preparation and participation of the patient in the decision to move to a home appears to affect directly his adjustment. The resident was much more likely to be satisfied if he and the family had sufficient time and information to decide. Residents who were only accepting of the nursing home, or who were dissatisfied, had done less adequate planning, and the resident himself was frequently not involved.

In more than half the cases where the patient was not entirely satisfied, he was not consulted, or had known of the decision for less than 2

weeks before it was made. This implies that individuals and families are not adequately informed about nursing homes, and the community needs a better understanding of the services which they provide. The generally unfavorable reputation of nursing homes may well cause delay in considering them as a solution.

Operators' Attitudes and Training

The study attempted to assess the nursing home operator's interest and attitude toward patients and also sought the resident's attitude toward the operator. The residents had almost uniformly favorable comments about the operator. Residents believed the operator was interested in their welfare, and all were highly disappointed that the operator did not spend more time with them. In general, the information obtained indicates that the operator plays an important, positive role in the resident's adjustment to the nursing home.

Interviews with operators indicated that their primary concern was the physical aspects of care—keeping residents clean, properly fed, and protected. Social aspects, such as keeping residents occupied and combating boredom and discontent, seemed secondary. Although physical care was emphasized, this usually did not include rehabilitative efforts. Occasionally the expense of rehabilitation efforts led to negative attitudes toward rehabilitation work.

The operators' attitudes may well reflect the emphasis of official inspection, which has explicit standards for a home's physical facilities and medical and nursing care. But, at least in the Missouri legislation, other aspects of operation which may influence the resident's adjustment to the home get little attention.

The operator's attitude is also affected by his background and training. In St. Louis County a few homes are managed by physicians, some by nurses, and one by a trained social worker. Most operators' educational background and preparation do not include professional training. Some have had only a high school education. Although inspections influence the service provided, the nursing home operator is ultimately responsible for his institution and the care of its residents.

Improved patient care can come only when

the operator has a more complete understanding of patient needs and of the background of official requirements. Improved care requires also that appropriate techniques be known to the operator.

Certainly the nursing home operator requires many skills which he now has little opportunity to develop except by unguided experience. The operator's varied, and not always adequate, training for his job and his importance to the resident point to a serious program need. Although nursing home associations recently have begun to provide needed professional information, there are not now adequate training programs. Regulation and inspection are of great value, but a considerable area of nursing home operation remains outside the scope of legislation.

Training for operators is, we believe, one of the most important activities the health department can initiate to improve patient care. The St. Louis County Health Department for the past 2 years has sponsored a monthly training program for operators. These programs, planned with a committee of the operators, have reviewed available professional knowledge on a wide range of topics such as fire prevention, nutrition, and cost accounting. These voluntary meetings have been well attended and seem to be one way of increasing the professional knowledge of nursing home operation. Aside from their informational function, they allow operators to share their concerns and trade ideas.

Conclusion

The nursing home program developed by the St. Louis County Health Department with other community agencies includes collecting information and research, legislative programs, and operator training. The program stems from the department's legal responsibilities as the licensure and inspection agency.

Specific features of the St. Louis County program may not be adaptable in other areas. Our experience, however, indicates that the community, the nursing home operator, the patient and his family, and official and voluntary agencies see the program as an appropriate health department function.

Surgeon General Leroy E. Burney in a recent

address to the convention of the American Nursing Home Association stated:

"Good administration, both within an institution and in licensing agencies, should be based on education and assistance, rather than on compulsion. . . . Standards and regulations should be in the form of basic principles, rather than an outline of specific details.

"Administrative difficulties, both in individual institutions and in public agencies, will not be satisfactorily resolved until the people of all communities accept nursing homes, in fact as well as in theory, as an integral part of their health services."

It seems to us that the health department can and should play an important role in achieving this goal.

Home Safety In San Jose

By Dwight M. Bissell, M.D., M.S.P.H.

Health Officer

San Jose, Calif.

In 1949 the city of San Jose, Calif., established an emergency first aid station and gave the health officer responsibility for administering it. Records were a necessary part of its operation. As we looked at the reasons that caused people to seek service, we were struck by the number of persons who had suffered accidental injuries. We were aware of the frequency of automobile accidents and of industrial accidents, but somehow we had never realized that such a large number of accidental injuries could occur at home.

We looked at the death records and found that year after year in our city of slightly less than 100,000 population 13 to 15 deaths were registered as due to home accidents. Few people had been interested in the fact that accidents were the third cause of death in our city, as they are in many other cities in California. We had a chapter of the National Safety Council, but it was interested primarily in industrial and traffic accidents. We knew that the National Safety Council was interested in home accidents, and we felt that the local chapter would be a natural ally in our concern about them.

Our health department personnel, numbering about 70, always work well together after we arrive at a group decision and agree on a program. We talked the home accident problem over at our division chiefs' meeting and decided to find out the degree of interest among those who would be working on this new problem. It seemed logical that nurses who visit families in their homes would be able to do some work in prevention of home accidents; that sanitarians who deal with housing and check on environmental sanitation of the home would be able to assist, too. Health education and vital statistics services would certainly be essential, and all of our epidemiological and administrative skills would be needed for a full-fledged attack.

When the subject was first presented to the public health nursing division, one nurse said, "Everyone has home accidents so what can we do about it, and why worry about it?" This comment gave us an opportunity to suggest that each of us record the accidental injuries occurring in our homes for a week or two to find out what really happens. Before the recordkeeping period was over, there was much discussion about the things that cause home accidents and about our unsafe environment. We began to hear comments about the number of home accidents. Environmental hazards seemed to be lurking everywhere. The experience produced convincing evidence that home accidents happen to all of us and that there are things one can do to prevent them. Most of our injuries, incidentally, were cuts and falls.

Community Participation

We have never tried to solve public health problems alone in San Jose. We believe that everyone who is interested has a right to share in planning and activities.

Each of us began to search for individuals or groups interested in home accidents. A number of insurance companies, we discovered, had a vital interest, and some of them were already active in this field. Some 30 industries were concerned, we learned by calling personnel directors together. Industry loses money every time a worker is absent from his job. He may be replaced, but the new worker is usually not

as efficient as the old one. One large industry employing 3,000 or 4,000 men had a home accident prevention program "on the books." By bringing attention to that program, the industry was able to develop a more realistic one.

Another group that became interested in home accident prevention was the Apartment House Owners Association. Fewer accidents in the apartments would mean lower insurance premiums. PTA groups, welfare groups (particularly those serving old-age pensioners), and health agencies were others among a total of about 70 groups finally invited to send representatives to a meeting to discuss organization of a program to prevent accidental injuries in the home. Pediatricians naturally had a leading role, but dentists, surgeons, clergymen, and many others were also interested.

We had some doubters in this group too, but exploration of the matter convinced them of the value of preventing home accidents. In fact, one of the original opponents became the strongest supporter. He "sold" himself by asking questions. It was easy to sell those agencies that could see a financial gain in preventing home accidents. The social workers, for example, quickly realized that their aged patients were much more expensive to the county welfare fund when they had to be cared for in bed than when they were ambulatory. The PTA members realized that they could protect their children's health better if they knew how to prevent the many cases of poisonings, burns, cuts, falls, and other accidents characteristic of growing up.

Accident prevention is a matter of personal health, and some of the people working with this program almost became neurotic about the subject. Because of the emotional and personal aspects of these preventive activities, the program had a stimulating effect on every person involved. Disability and death were constantly evident. One could hardly mention home accidents without 1 or 2 people in the group relating a personal experience with a home accident. Identification of an individual or an audience with the problem was easy to establish. The death of a small boy from eating ant poison shocked the whole community into the realization that home accidents are extremely impor-

tant. Education projects in classrooms evolved from this incident, and teachers began to feel responsibility toward preventing home accidents as well as school accidents.

Our community group of 70 decided to organize, with the assistance of the health education division of the health department. Four active work groups and a steering committee were set up.

Initial Problems

Inquiring minds began to ask about the definition of terms, and definitions became a stumbling block for a time. The words "home" and "accident" had different meanings for different people.

Another problem was establishment of a baseline against which a statistical measure might be used to determine the value of the project to the community. With only a limited amount of money for this task and our desire to accomplish something, we did not establish a baseline satisfactory to some statisticians. We thought we had appropriate data, but we found on analysis that they were quite inadequate.

Death certificates are of limited value in determining the number of deaths from home accidents. For example, in our city the greatest number of such deaths are among people over 60 years of age, and the cause is generally a fall. Did the elderly man have a stroke and fall, or did he fall first, causing an injury to his head? Did the person with osteoporosis fall because of the thinning bone or because of the slick floor? Did the elderly man with a fractured hip who died of pneumonia 4 months after the injury die of a respiratory disease or from an accident? What was the intent of the person who took an overdose of medicine? Was it accidental or suicidal?

Morbidity data are even more likely to be inaccurate than mortality data. With rare exception, most of the morbidity figures I have seen for home accidents have been estimates. Some household sampling has produced results of apparent accuracy, but even these are still open to question. However, all of the statistical inaccuracies should not frustrate one completely. The data do give one a general idea as to causation and frequency.

What Can You Do?

Once we had acquired as much background data and information about the occurrence of home accidents as we could, our question to each of the 70 committee members was, "What can the organization you represent, or you yourself, do about preventing accidents?" If time permitted, I should like to enumerate all the extremely worthwhile projects these men and women suggested and carried out. Some were short-range projects aimed at maintaining interest; others involved long-range planning.

During the 5 years in which the Kellogg Foundation helped support our home accident program, we experienced all of the stresses and strains to which a health department is accustomed. Personnel who were working full time on the project changed. Even the health officer was gone for a year. Some excellent ideas failed to work out as planned. Inservice training programs were tried. Various methods of community education were used in this experimental project. Language barriers were encountered by foreign-born people.

Evaluation Efforts

The one question that we felt we must answer was, did the project do any good? Did it prevent home accidents in San Jose?

There is no known way in which an accident prevention program such as ours could be evaluated completely and specifically, for there are too many factors at work in a community: the local and national press, radio, and television, as well as experiences of neighbors and friends, to mention but a few. A 20 percent increase in the population during the 5-year period meant that many families had moved into the city and were exposed to accident hazards caused by a change in residence. There were changes in jobs, and many new industries were introduced. All of these factors had not only a physical impact but an emotional one as well. It would be difficult to claim that a particular event produced a particular result. Our own personal actions in preventing home accidents are produced by a mosaic of experiences.

What did the figures show? Because of the unreliability of available data, we did not give much credence to the death certificates, which

showed that accidental deaths decreased considerably. Approximately the same number of home accident cases were being treated at the first aid station after the program as before, but our population was increasing and people were discovering the value of the station. We decided that perhaps another type of evaluation would be of greater importance than a statistical one.

We asked each of the persons who had volunteered to work in the program what he thought about it. Did the home accident prevention material help teachers to teach children about safety? Were the pamphlets prepared by our health education division of assistance to pediatricians and physicians in teaching parents about accident prevention? We were asking for an honest evaluation, for an opinion, of the total project. The evaluations varied greatly, as each one considered the accomplishments from his own point of view.

We also evaluated the program by the requests that we had for literature. We have had requests to permit reprinting of our pamphlet on prevention of accidents in childhood from many private physicians and local and State health departments in the United States. I am sure that these reprints would now total well over a half million.

Integration With Regular Programs

On June 30, 1956, the 5-year program ended, and our home accident prevention activities were integrated into the regular activities of the health department. We have continued to record and code services in this field. We have continued to provide health education services wherever we can.

One cannot introduce a new health program to a hard-working staff without advising them of work priorities. This process means that something must be dropped. The activity that is dropped depends on the interest of staff workers as well as on that of supervisors and administrators. Consequently, inservice training is an important function if home accident prevention activities are to continue. Few schools of nursing or schools of public health emphasize adequately the need for accident prevention activities.

Recently, I asked some of our staff members to be specific about what they were doing in

accident prevention. Some were spending a considerable amount of time on school safety, infant safety, or safety in the home. It was interesting to note that four nurses who had been employed in the last 3 months and had not completed their inservice training in this field were not nearly as aware of either the problem or the methods of teaching as the persons who had had experience during the home safety project. Each person must demonstrate to himself that accidents can be prevented and that they are important in public health whether a particular health department or voluntary agency recognizes it or not.

General Observations

In summary, I should like to offer a few generalizations in this matter of accident prevention.

Accidents occur because of an individual's relationship to his environment. During infancy the degree of protection must be extremely high. The wise parent gradually lessens this protection and gives the child more and more responsibility as he is able to accept it. The question that faces every parent is, how much protection should a child have at each age? How much protection should the community supply even to adults? Under normal circumstances an adult with reasonably normal behavior gets along fairly well until chronic disease or old age begins to lessen his physical ability to compete with the natural hazards of living. It is then necessary for him to be surrounded again with an increasing amount of protection until he may require complete protection before his death. Thus accident prevention becomes a study of growth and decay.

Accidents occur because of man's emotional reaction to his environment. Mental health problems today present the most difficult challenge for us in public health to assist large groups of people. The distraught, disorganized mother with many children and no assistance in supervising them is going to have more home accidents than the one with equanimity who can instill a feeling of independence and assurance in her offspring. The choleric individual will have more accidents than his equanimous neighbor.

Public health's problem is how to immunize the person whose reaction to his environment

may cause accidental injuries. In some individuals emotional imbalance is temporary; in others the usual behavior pattern is conducive to accidents. Both types need insight into their problems, and usually they require assistance in acquiring that insight.

Immunization for a person with normal behavior may consist of having an accident, then asking himself what he should do to prevent the next one, and finally taking reasonable, logical action as a result of his self-analysis. Unfortunately, many people who have numerous accidents do not take an analytical approach. Consequently, the epidemiologist must ask such people, "How did the accident happen?" "Why did it happen?" "What do you think you can do to keep it from happening again?"

It should be recognized that environmental factors can play a role in the causation of accidents. A slippery bathtub, a ragged carpet, an unlighted stairway, and many other things may contribute to an accidental injury. But it is always much easier to blame something or somebody than it is to look at ourselves and admit that we were at fault.

Because almost everybody has a few accidents each year, it is difficult for the health department to develop an effective accident prevention program. What we need is a way to concentrate our efforts on those families that are having the greatest number of accidents. Our problems are case finding and identification of the accident repeaters. We are engaged at present in a research project sponsored by the National Institutes of Health, Public Health Service, to devise a method by which a health department can find families who have a high incidence of home accidents.

With limited health department facilities, it is extremely important that the problem of case finding be solved. Until we have improved our skill in finding high-incidence families, our efforts will be as disseminated as were those against communicable diseases before the epidemiology of these diseases was established. Prevention of accidents depends on finding persons who are causing accidents to themselves and their families. With the problem thus identified, accident prevention will be within the capabilities of an average health department.

Gains in Industrial Safety

The loss of life in occupational accidents has decreased from 17,000 to little more than 14,000 a year in the last 15 years, according to the *Statistical Bulletin of the Metropolitan Life Insurance Co.* (October 1957).

Many industries have improved their safety records. The transportation industry provides a notable example. The occupational death rate for trainmen of all categories, as a group, dropped from 136.2 per 100,000 in 1939-41 to 47.3 in 1954-56.

In the past 15 years, workers in the petroleum industry have reduced by more than two-fifths their on-the-job accident fatality and permanent total disability rate. The rate for all departments combined dropped from 31.9 to 18.0 per 100,000 between 1939-41 and 1954-56. Part of the improvement is attributable to technological advances.

Similarly, in the chemical industry, the introduction of automatic machinery in many

operations has apparently lessened the exposure of workers to accident hazards and toxic materials. The chemical companies show a drop of nearly three-fourths in the rate of fatalities and permanent total disabilities during the years under review.

Several of the more hazardous industries have likewise made noteworthy progress in lowering fatal accident rates. The accident death rate among coal miners has decreased from 230.6 to 166.7 per 100,000 in the last 15 years. The lumber and electrical industries appear to have reduced their fatal injury rate by approximately one-third during the same period.

Much more remains to be accomplished, particularly in industries which have lagged behind in promoting safety programs. In addition to the 14,000 lives taken annually, 2 million workers are injured in accidents arising out of and in the course of employment.

TRAINING PROGRAMS



for **Milk Plant Operators**



NICHOLAS A. MILONE, M.S.

EMPHASIS has been and is placed on the need, value, and methods of instruction of food handlers other than those concerned with milk processing. If the published literature is used as the criterion, however, not much has been done regarding the education, training, and motivation of milk plant operators and owners.

Several reasons may account for the general lack of training programs for milk plant operators. The chief reason appears to be a current trend toward considering the sanitary objectives of milk control as a *fait accompli*. Tending to negate this assumption are some recent findings. Among these are a recent paratyphoid B milkborne outbreak incriminating pasteurized milk, equipment controls, and the human factor (1); laboratory thermal resistance studies indicating that heating *Coxiella burnetii* suspended in whole raw milk for 30 minutes at 143° F. is insufficient to eliminate

all viable rickettsiae, suggesting thereby the need for tighter supervision of the pasteurization process (2); newer developments in the design and operation of high-temperature, short-time pasteurizers (3); the necessity for additional thermal resistance data on "no hold" and similar high temperature processes (4); and the closely associated need for the development and redesign of automatic time-temperature controls adapted to the demand of newer processes for quick response.

In addition, the New York State Department of Health recently compiled data to explain the causes for underpasteurization, which had been averaging 1.15 percent in New York State since 1949 (5). This department attributed the causes to (a) delegation of responsibility for pasteurization to unqualified relief operators, (b) change of management, (c) labor turnover, (d) moral and mental deficiencies of the operator, and (e) carelessness. Experience has shown that the human element may be considered the most important stumbling block to sanitary needs.

Nor should a casual statement to the effect that many more or less important intentional and unintentional violations of local, State, and Federal sanitary code regulations take

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place daily in many plants cause eyebrow raising among the initiated. In fact, considering the complexity of the modern pasteurizing process it would be surprising if such were not the case. From this standpoint, one cannot escape the strong suspicion that some potential outbreaks are avoided by the now common practice of overpasteurization.

Although there is considerable justification for holding management responsible for the proper operation of plants, health agencies cannot and should not miss the opportunity of promoting the spread of information as to the causes, nature, and prevention of prevalent diseases and the preservation and improvement of health. Certainly most will agree that relying solely on the punitive approach leaves much to be desired.

There is little doubt that existing defects in equipment and operation in milk plants may be attributed to some lack of training, education, and motivation. In an attempt to fill this need, the writer, with the cooperation of the health jurisdiction and milk dealers concerned, presented training programs in applied dairy and sanitary science to the plant owners, managers, operators, and personnel of Washtenaw County (March 13 to May 1, 1956) and Calhoun County (October 12 to November 16, 1956) in the State of Michigan. The 6-week course in Calhoun County was essentially the same as the Washtenaw County 8-week course with the exception of minor details.

Our experience, tailored to suit particular needs, may serve as a guide for other control agencies and dealers interested in the cooperative development of similar courses.

Preliminary Actions

At the initial meeting, the milk dealers were represented by owners and managers and the local health department by the public health engineer, educator, and sanitarians. We decided to hold the meetings each Tuesday evening at the Ann Arbor and Marshall Court Houses from 7:30 to 9:30 p. m. for 8 and 6 weeks. All plant personnel were invited to attend on a voluntary basis since they would be contributing their own time. The dealers agreed to bear the bulk of the expense. The

course was designated "Applied Sanitary and Dairy Science," the term "dairy" being used to indicate that the instruction would not be confined to sanitation.

A public health educator was assigned the task of publicizing the program by means of newspaper, radio, and television. The dealers reacted favorably to this aspect of the program, believing it demonstrated the dealer's concern for the consumer's welfare.

Objectives of the Course

Main objectives of the course encompassed the following:

1. To familiarize the trainees with the properties of milk and milk products and the various environmental hazards that may affect quality and safety during the production, processing, storage, and transportation stages.

2. To interpret for the participants the intent and applications of sanitary regulations as exemplified by the Ordinance and Code of the Public Health Service.

3. To inculcate in the trainee desirable mental habits relating to contamination potential of product, equipment and operation, product quality and safety, cleaning and sanitation, plant layout and product flow, and liability and responsibility.

A list of the subjects presented in the course is given on page 56.

The necessary motivation was supplied by continually pinpointing the relationship between quality and economics.

Presentation of Subject Matter

Throughout all sessions it was of utmost importance to present the subject material effectively and to establish the critical awareness desired. All the material is amenable to an interesting approach if properly planned, prepared, and executed. The use of visual aids prepared by the instructor plus judicious selection of available aids helped enormously in making the program a success. For these reasons a few of the devices developed and used will be described. To help attain and maintain a high level of interest, many references to experiences were made, some of a humorous, many of a practical, nature.

General subjects presented during the training sessions

Basic fundamentals

Science of milk production
Nutritive properties
Microbiology Disease and quality
Performance and quality

Receiving of milk

Deck tests Receiving equipment
Clarifiers Filters Separators Milk waste
Milk transportation Bulk tanks

Heaters and coolers

Exchange equipment Homogenizers
Pasteurizing equipment Pumps
Bottle fillers and cappers
Temperature and time controllers
Construction, design, and operation
Inspection and maintenance

Sanitizing equipment

Bottles, cans, and equipment
Bottle and can washers
Water, detergents, and sanitizers
Tests for determining efficiency

Sanitary quality control

Laboratory tests Trouble shooting

Defects in market milk and cream

Causes Solutions Routemen and quality

Plant layout, design, and utilization

Product flow
Building and building facilities

Legal aspects for the dealer

Liabilities Responsibilities

[Detailed descriptions of course content and the methods and materials used may be obtained upon request from the author. An instructor's guide containing lecture notes and use of materials is in preparation.]

At the start of the first session, a bottle of milk was placed on the table in front of the instructor. After remarking on the simple appearance of the liquid and how easily it could be simulated by suspending some bolt chalk in water, he projected on the screen a chart showing in detail the components of milk. This action served as a dramatic means of impressing the audience with the great complexity of the product they worked with daily.

A nontechnical movie, *The Science of Milk Production*, sponsored by the Purina Company of St. Louis and made in cooperation with the University of Minnesota, was then shown clearly illustrating how the cow makes milk. The motion picture was very effective and maintained maximum interest throughout its presentation.

One of the main aims of the training program was to make the trainee "contamination conscious." A series of placards was especially prepared to fulfill this course requirement. The placards described and illustrated the intimate life of a microbe, the decomposition of an apple, and the decomposition of a dead cat (*♂*).

In the first of these, pertinent references were made to the ubiquitousness of microbes, their never ceasing activities, the absence of a tem-

perature regulatory system illustrating an important fact which makes refrigeration possible, the factors limiting growth, their small size, enormous numbers, amazing appetites, astonishing variety of diets, rapid multiplication under favorable conditions, and finally the fortunate fact that the majority of micro-organisms are not only innocuous to humans but are actually helpful and necessary.

The sequence on the decomposition of an apple traced the organic breakdown of an apple from the moment it falls from a tree to its ultimate decomposition by soil bacteria.

The last sequence, the decomposition of a dead animal, detailed in nontechnical terms the decay and final disintegration of the animal body.

Petri dishes containing sterile nutrient agar were then passed around, and the trainees were asked to talk, expectorate, sneeze, and cough over the exposed medium. One participant was asked to draw his finger over the surface of the agar and another to place a hair on the surface. Following incubation the resulting cultures were projected on a screen and discussed.

At this point it can be stated without equivocation that the trainees had been made, in varying degrees, "contamination conscious." A few

judicious and qualifying remarks avoided establishing a microbiophobic turn of mind. Ever present was the temptation for the instructor to go overboard in making a point and thus do more harm than good. The other procedures used to obtain the desired mental habits were presented in a similar manner.

Public Health Service slides (7) and motion pictures (8), illustrating lecture material, emphasized construction, design, and operation in nontechnical terms.

The subject of sanitary quality was explored by demonstrating the tests commonly used to measure quality, together with interpretation of results. Methods of overcoming causes of unsatisfactory results were discussed in detail.

At the conclusion of this session a chart containing, anonymously, the yearly performance data of each participating dealer was projected on the screen. By this means, it could be effectively demonstrated that unsatisfactory results could be overcome by efficient performance.

The demonstrative method was used almost exclusively during the washing and sanitizing session which included a discussion of the advantages and defects of common methods.

The plant session covered building, lighting, ventilation, product flow, and many other aspects that tend to make the plant more efficient and economical to operate. Examples were given of legal implications, and the responsibility of the dealer to consumers was stressed.

The session on defects in market milk and cream covered causes and means of overcoming the defects. Concrete and factual examples explained sanitary code regulations.

At the last session of the program a succinct summary touched on the major points of the course, with some emphasis on the economic phases.

Audience Reaction

Previous experience had indicated that dealers would be hesitant to ask questions during the question period held at the conclusion of each session, believing that such an action might reveal vulnerabilities to competitors. For this reason, a question box was used for depositing unsigned questions which were discussed at the following session. Another means employed

was the use of a health department representative to ask leading questions.

From observations made throughout the program, and from those obtained at the conclusion of the course from an interview with the participants, the following information was elicited:

- Dealer reaction was very favorable.
- Most of the plant personnel attended all of the sessions. This was as gratifying as it was surprising especially in view of the voluntary attendance arrangements. As a consequence the audience as a whole gained a general knowledge of the contents of the course while the specialized crews benefited from the specific instruction directed to them.
- The session on defects in market milk and cream was the most popular, a reflection of one of the main interests of the dealers. Since quality and safety are closely related, this attitude cannot be considered a drawback to the main objective of the program.
- There were strong indications that desired mental habits were instilled in the trainees.

Requests to present the program in other jurisdictions indicated that there is a market for these programs. It should be thoroughly exploited because of obviously inherent rewards. Qualified instructors for such programs are available in each health department and institution of learning.

Finally, it is considered wise to reemphasize that one of the most important prerequisites for success in the presentation of these programs is to make a continual bid for interest. This can only be accomplished by a vast amount of time, thought, effort, and initiative in planning, preparation, and presentation. Ingenuity will help considerably. The rewards, however, make it all worth while.

Critique

It may be felt that the subject matter presented within the allotted time was too extensive and intensive for maximum effectiveness, but our chief objective was to determine the need, value, and reception by industry of the training course. The general complexity of the subjects makes it mandatory to present them over periods consistent with the attainment of maximum effectiveness. Any jurisdiction presenting these programs that finds the suggested

course lengths unsuitable may adjust the time factor to its particular needs.

An important consideration for evaluative purposes is the fact that one such program is not sufficient to the needs of the participants. Milk technology is in a dynamic state and progress is being made daily in all its phases. Progress should by all means be communicated to the industry, and the most satisfactory means of accomplishing this is by the routine and continual offering of training programs, properly spaced so as to accommodate new material as it becomes available.

Accordingly, these programs should result in material gain for the processor, and, in conjunction with its inspection and laboratory programs, the control agency should obtain benefits not otherwise realizable. The consumer, for whom all this work is done, would profit in the greater protection which this means of communication achieves.

Summary and Conclusion

Contrary to popular conception a challenge still exists in the dairy field and will persist for some time to come. New processes and new developments continue to evolve and with them new problems requiring solution.

Trial training courses were conducted for milk plant operators in Washtenaw and Calhoun Counties in Michigan to evaluate the need, value, and reception of such training. The course subjects ranged from basic fundamentals in milk processing to legal aspects for milk dealers.

The results indicated that such programs on a continuing, routine basis would definitely aid and be appreciated by the industry. The responsible agency and the public would profit in the greater likelihood of a high quality, safe product.

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Helping the Housewife Prevent Accidents In the Home

A. L. CHAPMAN, M.D.

DURING 1956 about 28,000 people died from the effects of home accidents, and accidents of all types were the primary cause of death in all age groups from 1 to 35 years.

In comparison with the community reaction evoked by heart disease, cancer, poliomyelitis, and mental illness, the community reaction to accidents has been conspicuously weak. With the exception of the National Safety Council, some State and local safety councils, and a small number of pioneering State and local public health officials, few agencies have given accident prevention the emphasis it warrants. Perhaps a feeling of helplessness has fostered this lack of emphasis, but with the growing acceptance of the fact that at least 80 percent of accidents are caused by what people do or by what they fail to do, public health workers are in a better position to exert leadership in accident prevention.

Since they stem from the actions of people, accidents can be made the subject of study, analysis, and prevention in the same way that human factors involved in the susceptibility of humans to disease have been studied.

The magnitude of the research effort that will be needed to develop scientific data of sufficient quality and quantity to support scientifically valid efforts to control accidents will be great—no smaller, certainly, than the magnitude of the research effort now being made to determine the causes and means of preventing cancer, heart disease, and mental illness. Meanwhile, much can be done on an empirical basis to accelerate the present slow but steady decline in accident rates.

There is presumptive evidence, at least, that

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intensive as well as extensive efforts to organize communitywide education programs can contribute to a marked decline in the number of deaths and injuries resulting from home accidents.

Group Conferences

Since face-to-face, person-to-person communication is more apt to motivate people to act than communication using the printed word alone, the usefulness of the group conference technique is suggested.

Several reasons may be cited for limiting the use of the conference technique to housewives during the early stages of the development of a local accident prevention program:

1. Experience with the group conference technique has indicated that housewives are more conscientious in attending conferences than men.

2. Although many mothers now work, the great majority still remain at home during the day. As housewives they play a "guardian" role with respect to the children in the household and to oldsters as well.

3. The maternal instinct can serve as a source of motivation to influence the mother to attend group conferences on accident prevention and to apply the lessons learned there.

4. Group conferences can be fitted nicely into the framework of orthodox public health operations in most communities since many public health nurses already are skilled in group conference techniques. Public health nurses are accustomed to working with mothers.

Booklets on Accident Prevention

The Division of Special Health Services of the Public Health Service has available two booklets that can be used in conducting local group conferences in home accident prevention. These booklets will be released through the regional offices of the Department of Health, Education, and Welfare to State health departments for final distribution to local health departments.

The first booklet, entitled "One Way to Develop Local Home Accident Prevention Activities," describes the development of these activi-

ties. Four stages are suggested for introducing to public health workers or to housewives the principles and techniques that are important in the prevention of home accidents. Stage 1 provides for a series of weekly conferences at which subject matter contained in the second booklet may be discussed; stage 2 describes methods by which local resources may be identified; stage 3 gives three methods for determining the extent of the local home accident problem; and stage 4 lists eight typical activities that may be engaged in locally to provide experience and seasoning.

The second booklet, entitled "Home Accident Prevention Text," presents a digest of principles and techniques important in developing home accident prevention activities. Sixteen chapters describe the accident prevention

problem, the various factors which contribute to accidents, and the roles that can be played by public health workers and physicians.

The guide and the text can provide local health officers with a useful digest of current material on home accidents, plus an organized method of presenting it to members of their staffs and then, through group conferences, to key persons in the community. Both booklets may be used to orient housewives to the problem of home accidents and to methods of preventing them.

The task of involving thousands of professional public health workers and millions of citizens in an all-out attack on accidents is a tremendous one. It can only be accomplished by attacking the problem simultaneously on many fronts.

Potential Anticancer Compounds

New, potential anticancer compounds will be produced by six research organizations under contract with the Public Health Service. The chemicals to be synthesized under these contracts are designed to interfere with the growth of cancer cells in various ways.

One group of compounds, known as antimetabolites, inhibits the growth of cancer cells by blocking certain metabolic reactions. These compounds bear enough resemblance to needed chemicals to be accepted by the cells, but they also differ enough to interfere with the cells' metabolic processes of self-repair and self-reproduction.

Laboratory tests have shown that when cancer cells use certain antimetabolites, cell repairs are faulty and the cells either fail to grow and multiply or they die.

Synthesis of hormonal substances constitutes another promising avenue of cancer research. Both male and female sex hormones hinder the growth of cancer cells by changing the hormone environment which the cells need to continue reproducing.

The chemicals to be synthesized by the six research organizations will be tested against three types of animal tumors. Any of the hormonal substances that show promise will be used in clinical studies which hospitals throughout the country are conducting in cooperation with the National Cancer Institute, Public Health Service.

Stanford Research Institute, Menlo Park, Calif.; Southern Research Institute, Birmingham, Ala.; Medical College of Virginia, Richmond; and Monadnock Research Institute, Inc., Antrim, N. H., will prepare various kinds of antimetabolites for evaluation as anticancer drugs. The Upjohn Co., Kalamazoo, Mich., and the University of Chicago will produce new hormonal substances in quantities sufficient for laboratory studies and clinical trials.

The six contracts involve an expenditure of approximately \$793,000 and will be administered by the NCI Cancer Chemotherapy National Service Center.

Communitywide Pregnancy Reporting in Kauai, Hawaii

FERN E. FRENCH, M.A., LOUISA P. HOWE, Ph.D., JESSIE M. BIERMAN, M.D., ANGIE CONNOR, M.D.,
and DOROTHY H. KEMP, M.D.

A STUDY envisioned in 1953 by Yerushalmy and Bierman starts not with the birth, or the fetal death, but rather with the pregnant woman from the time she becomes aware that she is pregnant (1). Such a longitudinal study entails observation over a period of time of all women in a community who are known to be pregnant. Fetal deaths can therefore be studied not as isolated instances but as part of all the pregnancies in the group. The study on the island of Kauai, Territory of Hawaii, was planned along these lines.

In 1952, the Department of Health, Territory

Miss French is completing work for a doctorate in public health at the University of California School of Public Health, Berkeley. Dr. Howe, resident research director of the Kauai Pregnancy Study, and Dr. Bierman are respectively associate research sociologist and professor of maternal and child health at the same school. Dr. Connor is chief of the bureau of maternal and child health and crippled children's services and Dr. Kemp is director of hospital and medical care, Territory of Hawaii Department of Health, Honolulu.

This is the second report in a series entitled "Longitudinal Studies of Pregnancy on the Island of Kauai, T. H.," financed by the Children's Bureau and conducted jointly by the School of Public Health of the University of California and the Territorial Health Department. This paper was presented in basically the same form during sessions of the 84th annual meeting of the American Public Health Association, Atlantic City, N. J., November 12, 1956.

of Hawaii, and the University of California School of Public Health joined efforts in the countrywide Kanai project, designed to study the outcome of all pregnancies in the community and to learn as much as possible about the factors associated with that outcome. The basic methodology involves periodic investigations made from early in pregnancy through termination in live birth or fetal death and continuing with surviving infants for at least a year.

Thus, unfavorable outcomes can be studied not as isolated instances but as part of all the pregnancies in the group. By following each pregnancy throughout its course and the infant for a period of time, it is possible to study physical and mental abnormalities related to prenatal or natal influences, as well as the social and economic factors involved.

An initial phase of the study used material obtained through a census carried out in 1953 to evaluate the usefulness and limitations of retrospective studies of pregnancy. Retrospective data gathered in this way, shown to be reliable for women under 50 years of age, have provided refined knowledge concerning familial tendency to three components of pregnancy loss: early fetal, late fetal and neonatal, and postneonatal fatalities (2). The second phase had the objective of determining the feasibility of communitywide pregnancy reporting with the size and type of staff and organization used in the study. The collection of adequate material would result in meaningful rates of fetal death, by period of gestation. At the end of the longitudinal study in 1958,

reports will be made on these fetal loss rates and on any associations between factors in the environment of the fetus and newborn and the outcome of pregnancy.

We present here the setting of the study, our experience thus far in communitywide reporting of pregnancies, and data accumulated during the 2½ years ending June 1956. It is hoped that this part of the study, which is comprehensive rather than intensive, will answer a few questions and produce clues for other research by more intensive or perhaps different means.

Setting of the Study

The island of Kauai lies at the northwest end of the Hawaiian chain, some 100 miles from Honolulu. Although three-fourths of the 30,000 inhabitants were born in Hawaii, the population is ethnically variegated. The population pattern shows Japanese (44 percent), Filipino (25 percent), Caucasian (14 percent), part-Hawaiian (11 percent), and a sprinkling of Chinese, Koreans, and Hawaiians. The people live in small towns and plantation camps that are scattered around the shoreline, while the mountainous and often rainy central part of the island is mostly uninhabited.

Agriculture is the principal "industry," the skills it requires increasingly approaching those of a large-scale industrial enterprise. Sugar cultivation goes on all year around, while pineapple harvesting and processing reach a peak in the summer, when a large number of women are employed in the canneries. Rates of pay are comparatively high in these two fields, but employment opportunities are distinctly limited, and other jobs pay poorly. The cost of living is high except for clothes and housing, of which not much is required because of consistently mild weather.

Since 1950 the size of the population has remained fairly constant, but the emigration of many of each year's high school graduates has left a disproportionate number of children and of older men, the latter mostly Filipinos brought in to work on the plantations. In 1950 nearly half of Kauai's dwellings were plantation houses, but since then there has been a notable increase in private home building.

Running water is practically universal, and only a few small districts lack electricity.

Excellent provision is made for health and medical care. There are 13 physicians on the island, 7 associated with the plantations and 2 serving as government physicians. Virtually all plantation employees and their families are enrolled in plantation medical care and hospitalization plans, and the Hawaii Medical Service Association, patterned after the Blue Shield-Blue Cross organization, currently has a Kauai membership of more than 5,000.

Hawaii's health department, one of the oldest in the United States, has had a notable record of achievement in the face of extraordinary problems. For example, it is said that none of the babies born in 1848 survived. Thirty years ago Hawaii's infant mortality rate far exceeded that of continental United States; now it is one of the lowest in the country, with 21 infant deaths per 1,000 live births in 1955. Kauai's rate was a little lower than that of the Territory as a whole.

The search for a place where a communitywide survey of fetal waste and a study of reproductive pathology could be carried out with some hope of success led to the selection of Kauai. The population is relatively stable; people live close to one another and are concerned with each other's welfare; babies are highly prized, and virtually all of them are born in hospitals. A high standard of medical care is maintained and is available to all, and excellent cooperation with health programs has been achieved in the past. It seemed likely, therefore, that such a research project might be given widespread cooperation by the physicians and by the population as a whole.

The Census

After a trial run in the summer of 1952, the first phase of the study got under way in February 1953. Six interviewers resident in Hawaii, 5 nurses and 1 social worker, set about obtaining a census. They listed the occupants of each house and recorded household information and brief personal data, including a reproductive history of all women 12 years of age or older. All apparent prospects were asked if they were then pregnant; if so, the date of the

reported last menstrual period was recorded. A pregnancy report card with a postage-free envelope was left with each woman, and she was requested to mail it to the health department as soon as she believed she was pregnant.

Local physicians were asked to submit each month a list of the mothers who had come to them for prenatal care. During later months, the physicians were supplied with special forms serving, among other purposes, as a source of pregnancy reports to the study. These were used by some physicians.

By September 1953, the enumeration was finished and data necessary for the retrospective phase of the study were at hand. Since then an attempt has been made to obtain similar information on new residents and to record the departure of persons who had been enumerated in the original census.

Campaign for Early Reports

In this study the earliest possible reports of pregnancy are those made by women after their first missed menstrual period. A drive for such early reports of pregnancy began in October 1953. In this same month, 2 public health nurses were added to the regular staff of the health department, regular reports of new pregnancies began to come in from some of the physicians, and newspaper articles about the study appeared in the weekly paper. A series of mother and baby care classes was planned by the health department, and nurses went from door to door asking mothers if they or their friends or neighbors would be interested in such classes—and if they were pregnant. Visits were made to newly wed couples, and talks were given to women's groups and church gatherings.

In the spring of 1954, an all-out drive to publicize the study got under way. Three local community organizers visited women and talked to small groups in various parts of the island, and a reporter's services were engaged for help with newspaper releases. Leaders in the community were brought together for a meeting at which the study was explained, and letters were mailed to all prospectively pregnant women, urging them to see their physicians early and to return an enclosed pregnancy re-

port card when they became pregnant. At meetings of the county medical society, the continued help of the physicians was solicited. As a crowning touch, milk bottles delivered around the island one day were bedecked with a printed message urging mothers to cooperate with the pregnancy study. As a result of these efforts more reports came to the study in 1 month than had ever been received before.

The job of finding new pregnancies continued with radio talks, speakers for various groups, slides shown in the theaters, posters, and mimeographed throwaways. In August 1954 and in January 1955, letters were sent to the pregnancy prospect list, thanking them for their past cooperation and enclosing a report card and envelope once again. In early 1955, the resident research director arrived, and during the next 6 months there was a gradual crescendo of activity. Starting in September, the health department laboratory, from which prenatal serology was ordered by the physicians, became an additional source of reports for pregnancies known to the physicians but not yet reported to the study. The next letter sent to the mothers at the end of 1955 took the form of a calendar with a report card. The campaign for early reporting continued until the end of 1956, when the number of pregnancies for followup was considered adequate.

Periodic Interviewing

Simultaneous with the drive for early reporting was the periodic interviewing of all reported pregnant women during their pregnancy. This activity began in May of 1954. Women identified early were interviewed three times during pregnancy; others twice or only once.

For this part of the study, 2 full-time and 4 part-time interviewers were added to the staff since the load was too heavy for the health department nurses to carry in addition to their regular duties. The project also had the assistance of two office clerks.

In early 1956, the first group of babies born to mothers who had been interviewed during their pregnancy were given pediatric and psychological examinations, procedures heartily welcomed by the mothers. Periodic inter-

viewing is scheduled for completion at the end of 1958.

Resulting Pregnancy Reports

Although some reports of pregnancy were received during the time the population was being enumerated, there was no attempt to obtain early reports until after the census. Since this paper deals with what was done to obtain reports early in pregnancy, analysis is limited to pregnancies with reported last menstrual period (LMP), beginning in 1954. LMP indicates the beginning of the last menstrual period. Weeks of gestation refers to weeks since LMP. Although the date of conception is usually fixed 10 to 14 days after the beginning of the last menstruation (3), conception is used synonymously with LMP here.

In addition to equalizing monthly periods, the lunar month, or 4-week period, has other advantages in keeping track of the week and lunar month of occurrence of many events involved in this kind of study. The first 7-day period in 1953 was called the first week and each succeeding week was given its appropriate number. As a result, intervals between various reports are determined easily. For example, if a first report of pregnancy was made on May 5, 1955, the 70th week, and the reported LMP was December 16, 1954, the 50th week, the interval from LMP to first report was 20 weeks. Groups of 4-week periods were designated as lunar month 1 through 13 for each year. This was particularly useful in comparing lunar months from LMP to first report with lunar months from LMP to first visit to physician or to termination of pregnancy.

Since each report of pregnancy was related back to the lunar month of reported LMP, for any particular month, after 40 weeks or so have elapsed, we accumulate the total cohort with reported LMP in that month. Some are reported soon after the LMP and some are not known until several months later; in fact, full-term pregnancies missed until delivery are not added to the cohort until approximately 10 lunar months after LMP. This procedure means a timelag, of course; cohorts for the first months of 1956 had not been followed completely by the cutoff date of June 30, and, for this reason,

figures 1 and 2 are carried through 1955 only. Cohorts with LMP in late 1955 may be slightly increased with very late reports coming in after June 30, 1956.

Such an allocation has definite advantages in this type of study. During each month there are a certain number of early pregnancies which are available for reporting. By looking at the total cohort, the percentage which was reported, for example, under 12 or 16 weeks' gestation can be determined for each month and results evaluated. After some experience in a community under study, the seasonal pattern of monthly cohorts and the percentage of early reports can be estimated without waiting for the total cohort to accumulate.

The success of the drive for early reporting in the late spring of 1954 and the drop in reports during pineapple-canning season each summer are particularly evident in figure 1. The solid line in this figure indicates the result of allocating each report to the month of reported LMP. As would be expected, fluctuations are less extreme than for reports by month received. With only 2 years for study, generalizations with regard to seasonal variation are not warranted. However, winter and spring months show a somewhat larger number of conceptions than do the summer months.

In table 1 and figure 2 we observe that about 40 percent of all first reports were for pregnancies with gestation period under 12 weeks and 75 percent under 20 weeks, while 90 percent were for those under 28 weeks. The percentage

Figure 1. Month pregnancy report received by study and month of LMP, 1954 and 1955.

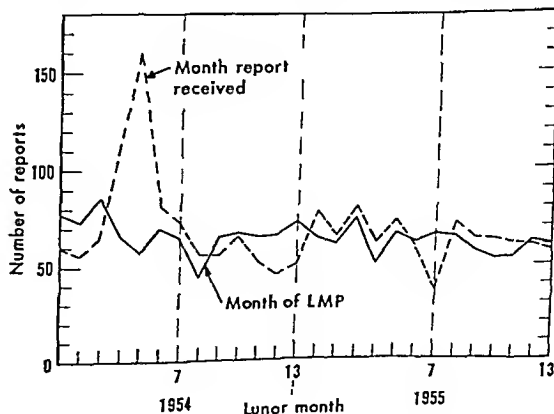
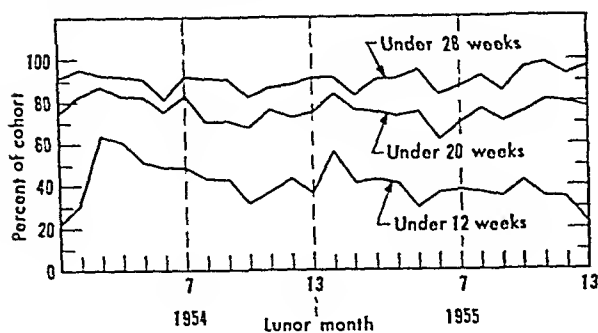


Figure 2. Percentage of monthly cohorts of conceptions reported to study by weeks, since LMP, 1954 and 1955.



of reports under 20 weeks was about the same for the 2 years, but the yield of earlier reports was not so large in the second year.

Source of Reports

Notification of many pregnancies were received from more than one of the following sources: the mother, the physician or his records, interviewer's activities, reports of laboratory serology tests, or social agencies. First reports are analyzed here in order to eliminate duplication.

Although most women presumably knew of

the study and had pregnancy report forms available through periodic mailings and therefore could have reported their first missed menstrual period in the 4-7-week period of gestation, only about 20 percent of first reports came directly from them. In spite of publicity that unceasingly stressed early reporting, some mothers were surprised that the study should want to know about them before they were absolutely sure they were pregnant. Indeed, it may be that the study's success in gaining acceptance by the community militated against early reporting by the mothers themselves. Some, when asked why they didn't notify the study immediately after they realized they were pregnant, answered that they knew the interviewer would be around sooner or later anyhow, so what was the need?

However, first reports sent in by mothers themselves were by far the earliest: more than 20 percent were for pregnancies under 8 weeks' gestation compared with 14.4 percent from study interviewers and 5.9 percent from physicians' records (table 2). Almost 90 percent of first reports from mothers were made before the 20th week compared with about 80 percent for interviewers and 70 percent for physicians' records.

Table 1. Percentage of monthly cohorts of conceptions reported to study, by weeks of gestation, according to lunar month of reported LMP

| Lunar month | 1954 | | | | 1955 | | | |
|-------------|----------------|---|----------|----------|----------------|---|----------|----------|
| | Monthly cohort | Percent of monthly cohort by weeks from LMP to first report | | | Monthly cohort | Percent of monthly cohort by weeks from LMP to first report | | |
| | | Under 12 | Under 20 | Under 28 | | Under 12 | Under 20 | Under 28 |
| 1 | 77 | 22 1 | 75 3 | 90 9 | 64 | 57 1 | 84 1 | 92 0 |
| 2 | 73 | 31 5 | 83 6 | 95 9 | 61 | 41 7 | 76 7 | 83 3 |
| 3 | 86 | 63 6 | 87 5 | 93 2 | 75 | 43 2 | 75 7 | 90 5 |
| 4 | 66 | 60 6 | 83 3 | 92 4 | 50 | 40 8 | 73 5 | 91 8 |
| 5 | 57 | 50 9 | 82 5 | 91 2 | 67 | 30 3 | 75 8 | 95 5 |
| 6 | 70 | 48 6 | 75 7 | 81 4 | 62 | 37 7 | 62 3 | 83 6 |
| 7 | 65 | 49 2 | 83 1 | 92 3 | 66 | 38 5 | 70 8 | 87 7 |
| 8 | 44 | 43 2 | 70 5 | 91 0 | 65 | 37 5 | 76 6 | 92 2 |
| 9 | 65 | 43 1 | 70 0 | 90 8 | 57 | 35 7 | 71 4 | 85 7 |
| 10 | 67 | 31 3 | 68 7 | 82 1 | 53 | 42 3 | 75 0 | 96 2 |
| 11 | 65 | 36 9 | 76 9 | 87 7 | 54 | 35 8 | 81 1 | 98 1 |
| 12 | 66 | 43 9 | 72 7 | 89 4 | 62 | 35 5 | 80 6 | 93 5 |
| 13 | 73 | 38 4 | 75 3 | 91 8 | 60 | 23 3 | 78 3 | 96 7 |
| Total | 874 | 43 4 | 77 7 | 90 1 | 796 | 38 5 | 75 5 | 91 2 |

LMP=Last menstrual period

Table 2. Source of first reports of pregnancy by weeks from LMP to report to study, LMP January 1954-June 1956

| Weeks from LMP to first report | Source of first report | | |
|--------------------------------|--------------------------------|--|--|
| | From mother directly (percent) | From interviewers ¹ (percent) | From doctors' records ² (percent) |
| Under 8..... | 22.3 | 14.4 | 5.9 |
| 8-11..... | 38.2 | 34.9 | 27.7 |
| 12-15..... | 20.1 | 22.1 | 22.7 |
| 16-19..... | 8.6 | 12.2 | 17.1 |
| 20-27..... | 7.6 | 11.2 | 18.1 |
| 28 and over..... | 3.4 | 5.3 | 8.3 |
| All periods: | | | |
| Percent..... | 20.6 | 28.3 | 51.2 |
| Number..... | 359 | 493 | 893 |

¹ Includes reports from health department nurses and 11 reports from social agencies.

² Includes reports from prenatal serology requests and those obtained by interviewers from doctor's records.

LMP=Last menstrual period.

NOTE: Limited to the 1,745 reports made prior to termination of pregnancy.

As it turned out, the largest number of first reports came from the office records of the physicians; these, however, were for more advanced pregnancies, on the average, than reports from other sources. Some physicians or their nurses sent in reports directly; others, however, preferred to have a member of the study staff copy the required information from

their office records. Some pregnancies were missed altogether, and others did not come to our attention until some time after the first prenatal visit to the physician. Beginning in 1955, some pregnancies which were known to physicians but not yet reported were learned about through requests for prenatal serology. Another large group is credited to the initiative of the health department nurses and the study interviewers. For all first reports received prior to termination of pregnancy, the yield of these various sources was about 50 percent from physicians' records and prenatal serology requests, about 30 percent from interviewers, and 20 percent from mothers.

Physicians' Records

Although 50 percent of first reports had their source in physicians' records, the remaining 50 percent were not completely unknown to the physicians. In fact, the study's records show that only 6 percent of all reported pregnancies were without prenatal visits. There are, undoubtedly, some incompleteness and some inaccuracies in the study's records of first prenatal visits to physicians. For example, inconsistencies sometimes appear between the date of the first prenatal visit given on the physician's report form or in his records, and the date reported by women in their interviews. The latter date is sometimes earlier in pregnancy—some physicians probably record as the first

Table 3. Reported pregnancies by weeks from LMP to first recorded prenatal visit to doctor, and by weeks from LMP to first report to study, LMP January 1954-June 1956

| Weeks from LMP to first prenatal visit to doctor | Weeks from LMP to first report to study | | | | | | Report after termination | Total reports | |
|--|---|------|-------|-------|------|---------|--------------------------|---------------|---------|
| | Under 8 | 8-11 | 12-15 | 16-19 | 20+ | Unknown | | Number | Percent |
| Under 8..... | 86 | 94 | 22 | 13 | 11 | 1 | 13 | 240 | 12.9 |
| 8-11..... | 34 | 261 | 87 | 33 | 17 | 0 | 29 | 461 | 24.8 |
| 12-15..... | 26 | 68 | 178 | 49 | 15 | 0 | 4 | 340 | 18.3 |
| 16-19..... | 18 | 35 | 36 | 104 | 26 | 0 | 1 | 220 | 11.8 |
| 20+..... | 9 | 39 | 37 | 33 | 268 | 0 | 19 | 405 | 21.8 |
| Unknown..... | 12 | 29 | 12 | 9 | 12 | 0 | 5 | 79 | 4.2 |
| No visit to doctor..... | 19 | 30 | 12 | 3 | 7 | 0 | 43 | 114 | 6.1 |
| All periods: | | | | | | | | | |
| Number..... | 204 | 556 | 384 | 244 | 356 | 1 | 114 | 1,859 | |
| Percent..... | 11.0 | 29.9 | 20.7 | 13.1 | 19.2 | 0.1 | 6.1 | | 100.0 |

LMP=Last menstrual period.

visit the first which is made after the pregnancy is reasonably well confirmed. In this analysis, the earliest visit in the prenatal period is used.

The fact that all but a small percentage were known to physicians prior to delivery points up the potential value of their records as an exclusive source of reports. However, certain questions arise: Were more reported pregnancies unknown to the physicians than to the study? How early in pregnancy were the pregnancies known to the physicians as compared with total reports to the study?

Six percent, or 114 pregnancies, were not reported to the study until a fetal death or live birth occurred, and, by coincidence, the same number, 114, had no recorded prenatal visit to a physician; 4 percent, or 71, were known only to the study and another 4 percent only to the physicians; and 2 percent, or 43, were unknown to both during the prenatal period.

The percentage of total reports known to the physicians in each lunar month of gestation is almost the same as the percentage known to the study (table 3). Close to 50 percent were known to each in the same lunar month. Of the 71 known exclusively by the physicians, 27 percent had no prenatal visit until 20 weeks or more gestation; of the 71 known only to the study, only 10 percent were learned about that late. An analysis of reports by single weeks from reported LMP indicates that for the first 6 weeks of gestation, reports to the study were, on the average, about 1 week earlier than those to the physicians; for the 7th through the 13th weeks there was no difference; for reports coming to the study after the 13th week, prenatal visits to physicians averaged about 1 week earlier.

Comments

Although the longitudinal method used here has definite advantages over the retrospective approach and over studying isolated aspects of the total problem, it presents some difficulties. In a community the size of Kauai with some 5,700 women 15 to 45 years of age, 3 years are necessary to identify about 2,000 pregnant women. Arousing community interest to the high pitch apparently necessary for early reporting, primarily by the women themselves, is obviously a difficult task; and maintaining

such interest over several years is even harder. However, in a community three times the size of Kauai, the early reporting period could probably be cut to 1 year. A shorter time span would certainly be an advantage, although finding a relatively stable and closely knit community of such size is not easy.

As has been pointed out, the earliest possible reports of pregnancy are those made by women after their first missed menstrual period. Although we did not consider it feasible in this setting, it would have been advantageous to have had confirmation of early reports through the provision of pregnancy tests. Furthermore, it is possible that the offering of such tests might stimulate very early reporting and add knowledge about pregnancy wastage during the earliest weeks after conception.

While the analysis of physicians' records as a potential source of pregnancy reports indicates that pregnancies, on the average, were known to physicians on Kauai almost as early in pregnancy as they were known to the study, it is necessary to bear in mind that in many communities, fewer than 94 percent of the pregnant women receive prenatal care. Our findings suggest that among the preliminaries for such a study is an investigation of the extent of prenatal care in the community and how early the care is sought. The custom of the women as well as physicians' policies regarding encouraging or discouraging early prenatal care will be important factors. Of course, the most critical point is the real assurance that all pregnancies, including those that are not yet confirmed, would be made known to the investigators without delay.

Summary

Besides the objective of utilizing data collected at a special census to evaluate the usefulness of retrospective studies of pregnancy, the principal aims of the longitudinal part of the study were to investigate the feasibility of communitywide reporting of pregnancies, to determine fetal loss rates by period of gestation, and to study associations between factors in the mother and the outcome of pregnancy.

A census of the 30,000 inhabitants of the island of Kauai was taken in 1953. The pres-

ent progress report on communitywide reporting of pregnancies deals with the identification, as early as possible after the first missed menstrual period of all women who became pregnant from the beginning of 1954. Periodic interviews of all such women identified and examinations of their babies began in the middle of 1954 and are still continuing.

The great variety of methods used to obtain early reporting of pregnancies included interviewing by regular public health nurses of the health department and by study staff, activities of community organizers, talks to community groups, newspaper articles, radio programs, letters to prospective mothers, and posters.

All reports of pregnancy are related to the month of reported last menstrual period, thereby allowing an analysis by monthly cohorts of conception. About 40 percent of all pregnancies were reported before the 12th week of gestation, 75 percent before the 20th week, and 90 percent before the 28th week.

First reports of pregnancies came directly from mothers in 20 percent of the cases, 30 percent came from interviewers, and 50 percent from physicians' records. Reports were earliest for those who reported least: 60 percent of first reports from mothers were under 12 weeks, 50 percent of the interviewers' reports were in this period, and 35 percent of those from physicians' records.

Although physicians' records yielded only 50 percent of first reports, 94 percent of the pregnant women on Kauai made at least one pre-

natal visit. A comparison between the time when physicians learned of the pregnancies and the time when first reports reached the study shows that physicians knew of the pregnancies almost as early as the study. Some 6 percent were known only to the study (mainly very early pregnancies resulting in early fetal deaths) and another 6 percent were known only to the physicians; 2 percent were unknown to both groups until after termination.

Creating and maintaining interest sufficient to get adequate reporting by the women themselves is an undertaking of no small magnitude. However, if a relatively stable population of larger size than Kauai could be found, the same number of pregnancies could be identified for followup in a shorter period, and community interest would not have to be maintained for such a long period of time.

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Reorganization in Michigan School of Public Health

The University of Michigan School of Public Health has set up a new department of industrial health and abolished the department of tropical diseases. This action was taken November 22, 1957. Personnel from the department of tropical diseases have been transferred to the department of epidemiology.

The change reflects a shift in emphasis in epidemiology since establishment of the school in 1941. Tropical diseases were of paramount importance then because of World War II. Now, industrial health has come to the fore with the advent of new plastics, pesticides, and other chemical products, and the interest in radiological health, air pollution, and other aspects of the industrial environment.

The Clinical Pathologist

RESEARCH

Selections from an address delivered by Harold L. Stewart, M.D., at the Joint Annual Meeting of the American Society of Clinical Pathologists and the College of American Pathologists, on October 3, 1957, in New Orleans.

PATHOLOGY may be defined as the study of disease, not merely the study of body fluids and of abnormal morphology. The pursuit of pathology, therefore, includes research and investigation. The clinical pathologist throughout his entire career in a hospital laboratory is asked to advise on and to participate in research problems, and to interpret the re-

sults of research done by others. During his board training the resident pathologist needs to familiarize himself with the methods of experimentation as well as with the broad principles of pathology. How can the clinical pathologist evaluate the results of research by others if he himself has had no instruction in research methods and no actual training or experience in

The Ward Burdick award for 1957, given annually for outstanding service in pathology, has been presented to Dr. Harold L. Stewart, chief of pathology, National Cancer Institute, and chief of the Pathologic Anatomy Branch, Clinical Center, National Institutes of Health, Public Health Service. The presentation was made October 1, 1957, at the Joint Annual Meeting of the American Society of Clinical Pathologists and the College of American Pathologists in New Orleans.

Dr. Stewart, an authority on cancer of the gas-

trointestinal tract, has held office in medical societies including the International Academy of Pathology, the American Society for Experimental Pathology, and the Maryland and Washington, D. C., Societies of Pathologists. He has also been a delegate to a number of international cancer conferences.

The Ward Burdick award is given in honor of the Denver pathologist who founded the American Society of Clinical Pathologists. Dr. Burdick, who died in 1928, was noted for his medical organization work.

the field? To expect this is to expect a man to be a successful clergyman without having studied theology.

THE PATHOLOGIST has independently led the way to many important discoveries. Witness the history of our knowledge of the function of the pituitary gland. It was Pierre Marie who, in 1896, discovered the role of the anterior lobe of this gland in acromegaly, and it was Benda who found growth to be related to the alpha cells. But this important finding was left for the biochemist and endocrinologist to exploit, chiefly because the pathologist was not skilled in other techniques. Pathology, it has been said, depends upon tools of other disciplines for its research. The pathologist of the recent past leaned heavily on bacteriology and immunology for problems in experimental pathology. Today, the experimental pathologist utilizes chemistry and physics in the study of molecular diseases and he will need to learn many techniques to equip himself to take advantage of the wealth of opportunities that he has for research.

It is safe to predict that in time all the lesions of human beings will have been studied by electron microscopy. Just as our knowledge of lesions first studied by the naked eye was enormously increased by study with the light microscope, so will our present knowledge of the histopathology of these lesions be expanded by the resolving powers of the electron microscope. No one is better qualified than the clinical pathologist to study pathological lesions by electron microscopy. He is not just a microscopist seeing particles whose significance he is unable to interpret but is one widely familiar with the morphology and biology of disease.

The "mitochondria" revealed by the electron microscope and the mitochondria isolated by the biochemist in differential centrifugation, which are hailed as something new and strange, were discovered in Leipzig by the pathologist Richard Altmann in 1890 and named in 1898 by the pathologist Benda, who studied them in pathological tissue. The pathologists gave this discovery of mitochondria at once to the biochemist and the cytologist, who believed them

to possess and probably to produce most of the cytochrome oxidase and other respiratory enzymes of the cell. Little is known of these organoids in pathological tissue and nothing of their behavior in human tissue. The pathologist should now return to this important field after more than 50 years of neglect.

THE DISCOVERIES that cancer can be induced by X-rays, by tars, and by aromatic polycyclic hydrocarbons led to a great deal of work on carcinogenesis which during the 1940's and thereafter has waned. Today too few pathologists are trained in experimental carcinogenesis. The techniques are not difficult to master. The clinical pathologist already possesses the necessary basic knowledge, including the procedure for a careful autopsy. Almost the only other things he needs to know are the design of the experiments and the methods of preparation of the known or suspected carcinogens for their administration by different routes. . . .

THE FOOD on the American table today in a well-balanced diet of acceptable form may contain many synthetic additives. Some may be toxic and some even carcinogenic for laboratory animals, while other food additives utilized for years past have never been tested adequately for chronic toxicity and cancer-inducing activity. New food additives are being introduced at a rate that precludes careful toxicological testing unless the number of investigators in the field of carcinogenesis be considerably expanded. There is pressing need for experimental research in this field.

THE CHEMIST, the biologist, or the physicist who does research may know his own subject thoroughly, but usually knows nothing whatever about pathology. The pathologist, on the other hand, well trained in anatomical pathology and laboratory medicine, also knows a good deal about chemistry, biology, and physics. Some pathologists have majored in one or another of these subjects, and others hold the degrees of master or doctor of philosophy. This makes the pathologist an ideal collaborator

in research problems, the primary scope of which lies outside the field of pathology.

A number of research problems, the basis of which lies primarily in disciplines other than pathology, still require pathology for their interpretation and solution. Too often, the pathological material in such experiments is discarded without examination. Not long ago, I read the report of a long-term toxicological experiment involving more than 500 rats. The statement was made that the rats were necropsied and no tumors were found in either the control or the experimental animals. It would be virtually impossible not to find many tumors in 500 rats, 20 or more months of age, of any special strain or breed or randomly selected market rats. Of course, a tumor does not exist for the investigator who does not have the training to detect a tumor at necropsy. It is important, therefore, for pathologists to collaborate with experimentalists trained in other disciplines so that the pathological lesions are properly recognized and recorded.

WHAT are the characteristics of a research man? No prevailing characteristic to my knowledge marks a potential investigator, unless it be the possession of an innate drive to explore a new idea even against advice. Certainly, there is no average investigator. Research has been defined in part as finding things without being told. The investigator is able to correlate seemingly unrelated facts. He knows what constitutes proof. Young or old, he must be keen enough to observe his results no matter in what direction his experiment leads and to turn his mistakes to good purpose. The research worker himself is a worthy subject for research, and some day some enterprising student of psychology may determine and record the recipe of his composition.

The greatest caution should be exercised to avoid the discouragement of a young resident who proposes an experiment. The experiment may appear inconsequential and often wholly impractical, but I have found that it is unwise to ridicule any plan for an experiment. It happens ever so often that one of these seemingly inconsequential or impractical experiments leads to results of great importance. It was the

usefulness of seemingly useless research knowledge that led Marconi to develop wireless telegraphy. The most important factors in research are a desire to do an experiment and the impatience to get to work on it. All else is subordinate. A proposed experiment is often condemned because it has been performed previously. One needs only recall that prior to the development of insulin therapy for diabetes by Banting and his associates, other investigators had studied the effects of ligation of the ducts of the pancreas. Yet it was Banting who finally extracted the active factor from the islets of Langerhans by using modifications no one had carried out successfully before. It is clear that even though an experiment may have been performed previously something new may be found upon repeating it.

The beginner in research is apprehensive lest he err in his first experiment. Inertia retards many aspiring scientists from taking their first steps in the field of research. One has to get on with the work and realize that mistakes are inevitable. They can, however, often be turned to profit and may lead to the solution not necessarily of the problem under investigation, but rather of another entirely different and often more important one. It does not matter much whether the resident discovers anything new or publishable. The experience gained will be sufficient reward. Those who direct programs of residency training have a responsibility to see to it that these fine minds are given the opportunity to bring their ideas and talents to bear on experimental problems. Finally, the young investigator should be warned that for a large part of the time he works in research he will be doing the hardest and most uninteresting kinds of work that may involve cleaning animal cages, washing glassware, and cleaning up after necropsies. He needs encouragement and consolation together with all the help that can be given him to lessen the onerous duties that constitute so much of research.

THE TRAINING of a pathologist in the modern aspects of service work in clinical pathology has reached a peak in the United States that is unsurpassed elsewhere in the world. However, his reading should not be

limited to factual textbook material. He should be encouraged to read some of the original speculations of the great thinkers in pathology and research. How many residents are advised to read Nicholson's provocative essays on the formation of tumors, or Rokitan-sky on the humoral theory of disease, or Virchow on cellular pathology? or indeed such classics as the autobiography of Sir Ronald Ross? . . . The training of a pathologist in tumor pathology emphasizes accurate diagnosis of the biopsy specimen—almost never speculation as to the possible causes of tumors.

The resident training program should provide (a) more time to think and philosophize; (b) more instruction in the design and execution of experiments and the interpretation and application of the results; (c) recommendations for reading original contributions to research; and (d) access to library facilities that are adequate for the needs of a research worker.

HOW does the admissions committee choose or reject a candidate for medicine, and what is the impact of his choice on research in pathology? It is, I am told, the aim of many admis-

sions committees to select applicants on the basis of high grades in college and the possession of certain qualities . . . that somehow or other indicate that the selected individuals will become good practitioners of medicine. So far as I know, no admissions committee deliberately selects students for medical school who possess the qualities needed for research. Consider the influence on the admissions committee of an answer to a question that the candidate for medical school might be asked. The question may be: "Did you go to the football game last Saturday?" Suppose the reply is "I spent the afternoon in the library reading some early editions of Machiavelli's *The Prince*," or "I spent the afternoon in a cool, quiet saloon scheming to eliminate some stupid premedical courses." Are these the kinds of answers calculated to get oneself admitted to medical school? And yet one must admit these answers reflect both honesty and originality, two excellent qualities for an investigator.

Dr. Stewart's paper will appear in full in the American Journal of Clinical Pathology.

Health Research Facilities Grants

Expansion of the Nation's health research facilities by at least \$120 million is under way as a result of grants awarded by the Public Health Service during the first 2 years of its 3-year grant program.

Financed by an appropriation of \$30 million authorized for each year, the grants are allotted for construction and improvement of facilities devoted to research in the basic science areas on such diseases as cancer, heart disease, and mental illness. An amount equivalent to the grant, or more, is supplied by the participating institution.

Approval of 43 new grants totaling \$3,698,452, in October 1957, completed allocation of the \$60 million appropriated for fiscal years 1957 and 1958. Benefited in the latest action were 39 institutions in 22 States, the District of Columbia, and Hawaii.

Under the new program, grants are approved by the Surgeon General on the recommendation of the National Advisory Council on Health Research Facilities. A total of 251 grants have been made since the program's inception in June 1956.

Clinical, X-ray, and Serologic Changes With Histoplasma Infection

NORMAN W. ANDERSON, M.D., IRENE L. DOTO, M.A., and
MICHAEL L. FURCOLOW, M.D.

ALTHOUGH considerable information about histoplasmosis has been accumulated since this fungus infection was first described in 1906, much still needs to be learned about the frequency and severity of the disease accompanying primary infection. Following the classic work of Smith and his colleagues on *Coccidioides* infection in personnel of the U. S. Army (1), it was decided that such personnel, with their available medical care and complete records, would be an ideal group for a study of histoplasmosis. Consequently, in 1953 a study was initiated at Fort Leavenworth, Kans., by the U. S. Army Hospital on the post and the Public Health Service. Children of Army personnel participated.

The study was undertaken to determine the spectrum of illness accompanying *Histoplasma* infection. This was accomplished by observation of the clinical, X-ray, and serologic changes which accompanied conversion of the skin test from negative to positive. Its basic plan was to find a large number of children

with a negative reaction to the histoplasmin skin test, observe these children over a period of time, and retest them to determine the infection, or conversion, rate. Clinical, X-ray, and serologic changes could thus be observed in a group who became infected and in a much larger group who did not and who therefore would serve as controls. Other interesting epidemiological information concerning infection was also collected.

Material and Method

Fort Leavenworth, in northeastern Kansas about 30 miles from Kansas City, is the seat of the Command and General Staff College of the Army. The vast majority of the men stationed at this post are officer students of the school, arriving in August each year and departing the following June. These officers and their families have already had several years of Army life before coming to the post, including residence in all parts of the country and overseas. The children of these families formed the bulk of the children included in this study. Most of the remainder, but less than 10 percent of the total population tested, were children of the permanent personnel of the post living in the city of Leavenworth.

A preschool physical examination of all children is conducted routinely by the Army medical staff each August and September when the new families arrive on the post. In May of each year a smaller roundup is held for children who have arrived on the post or in the area later in the school year. These two examina-

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Col. R. M. Patterson and Lt. Col. Francis W. Lanard assisted in the supervision of the study; Capt. Sumner Hoffman and 1st Lt. Sheldon Kessler in the testing, and Maj. R. V. McAllister in the X-ray interpretation. David Sachs and Peter Ney assisted in the statistical analysis.

tion periods provided an opportunity for at least two tests of a large number of children, with a suitable observation period between.

For the histoplasmosis study, September 1953 through May 1955, skin tests with histoplasmin were given along with the routine tuberculin and Schick tests. All children present at the examination received the skin test. They ranged in age from 5 through 18 years.

In the fall of 1953 approximately 1,500 children were skin tested for histoplasmosis, and the following May those whose initial tests were negative were retested. Also in May, 50 more children were added to the study. In the fall of 1954 the 600 histoplasmin negative children who were still on the post from the previous year were retested, and 1,300 new arrivals received their first test. Those retested included the negatives among the 50 added in May, who were being retested for the first time, and continuously negative children, who were being retested a second time. The histoplasmin negatives among these 1,900 children were retested in May 1955. A total of 2,872 children were included in the study.

The histoplasmin used was lot HKC-5 diluted 2:1,000. This potency is equivalent to that of standard histoplasmin. The tests were all given intradermally in the right arm, and readings were made at 48 hours with measurement of the erythema and induration. An induration of 5 mm. or more at the 48-hour reading was considered a positive reaction. Children whose skin tests changed from negative to positive during the interval between the two examinations were converters. Those whose tests remained negative and those with positive reactions on the first test served as controls.

At the time of the two fall skin tests, blood was obtained for a serologic test on each alternate positive reactor to histoplasmin. When the negative reactors were retested, either in the spring or in the fall, blood specimens were obtained from all the children whose skin tests had changed from negative to positive and on the preceding and succeeding child in the examination line. The latter procedure provided controls, children whose skin tests remained negative, for the serologic testing.

Table 1. Percentage of children positive to histoplasmin on initial test, according to age, Fort Leavenworth, Kans., 1953

| Age (years) | Number tested | Number positive | Percent positive |
|-------------|---------------|-----------------|------------------|
| 3-4----- | 263 | 5 | 1.9 |
| 5-6----- | 470 | 21 | 4.5 |
| 7-8----- | 314 | 17 | 5.4 |
| 9-10----- | 271 | 21 | 7.7 |
| 11-12----- | 136 | 21 | 15.4 |
| 13-18----- | 86 | 17 | 19.8 |
| Total----- | 1,540 | 102 | 6.6 |

Serologic tests were performed by Dr. Joseph Schubert of the Communicable Disease Center, Public Health Service, Chamblee, Ga., and by Dr. Samuel Salvin of the Rocky Mountain Laboratory, Public Health Service, Hamilton, Mont. Dr. Salvin performed a precipitin test using purified histoplasmin as the antigen and a complement fixation test using whole yeast phase organisms as the antigen. Dr. Schubert performed a complement fixation test using histoplasmin as the antigen. These tests were done without knowledge of the skin test status of the individual.

Depending on the size of the child, either an 11- by 14-inch or 14- by 17-inch chest X-ray was obtained for each at the time of the initial histoplasmin skin test. At the time of the retesting similar X-rays were taken of all children whose skin tests had changed from negative to positive and on some of the children selected for controls. At the same time second X-rays were taken on the initially positive reactors who had been serologically tested in the previous examination. All X-rays were interpreted by a qualified radiologist as well as by other physicians experienced in the interpretation of chest X-rays.

During the retesting, a questionnaire was given to the parents of each child. It asked about family visits of a day or more off the post, any illnesses which had occurred in the interval between tests, and other pertinent epidemiological factors. To supplement the questionnaire data, clinical records at the outpatient clinic and the post hospital were reviewed for pertinent illnesses during the interval. Illnesses associated with upper respiratory infec-

tion, bronchitis, pneumonia, and gastrointestinal disturbances were considered pertinent and were summarized on the child's record with respect to onset and duration. Clinic records were available for 2,375 of the children. They were not available for the remaining 497, including 2 converters, because of the transfer of the father.

Basic Prevalence and Conversion Rates

In table 1 are shown the age-specific rates for histoplasmin sensitivity determined from tests of 1,540 children in September 1953. The overall prevalence is about 7 percent, with children

Table 2. Age-specific conversion rates for histoplasmin skin test, Fort Leavenworth, Kans., 1953-55

| Age (years) | Number negatives retested | Number converters | Conversion rate | |
|----------------------|---------------------------|-------------------|--------------------|--------|
| | | | Observation period | Annual |
| Winter 1953-54 | | | | |
| 3-6..... | 534 | 12 | 2.2 | 3.3 |
| 7-10..... | 429 | 24 | 5.6 | 8.4 |
| 11-18..... | 143 | 7 | 4.9 | 7.4 |
| Total..... | 1,106 | 43 | 3.9 | 5.9 |
| Summer 1954 | | | | |
| 3-6..... | 124 | 0 | 0 | 0 |
| 7-10..... | 186 | 2 | 1.1 | 2.6 |
| 11-18..... | 89 | 3 | 3.4 | 8.2 |
| Total..... | 399 | 5 | 1.3 | 3.1 |
| Winter 1954-55 | | | | |
| 3-6..... | 464 | 7 | 1.5 | 2.3 |
| 7-10..... | 476 | 5 | 1.1 | 1.7 |
| 11-18..... | 217 | 8 | 3.7 | 5.6 |
| Total..... | 1,157 | 20 | 1.7 | 2.6 |
| All periods combined | | | | |
| 3-6..... | 1,122 | 19 | 1.7 | 2.5 |
| 7-10..... | 1,091 | 31 | 3.0 | 4.5 |
| 11-18..... | 449 | 18 | 4.4 | 6.7 |
| Total..... | 2,662 | 68 | 2.8 | 4.0 |

11 years and over showing much higher rates (average 17 percent). The percentage positive increases with age even though the geographic background of these children is varied. The prevalence of histoplasmin skin test sensitivity observed for the succeeding periods of study was similar to that for the first.

The age-specific conversion rates, shown in table 2, are based on the number of negatives that were retested at the end of each observation period and the number of children who had converted to a positive reaction during the period. Rates were calculated for the period of observation and then adjusted to a yearly rate. The total yearly rate for the first 8-month period (winter 1953-54) is about twice as high as that for either of the other two periods, and this seems attributable to an excessive rate of conversions among children aged 7-10 years during that particular period. The tendency for increasing rates of conversion with increasing age is apparent during all the periods. The 13- to 18-year-olds exhibit an annual rate of 11 percent compared with 3.6 percent for children aged 12 years or less.

Further analysis of the conversion rates is seen in table 3, which shows the rates of conversion among residents and among nonresidents of the post who returned questionnaires. Nearly all the nonresidents lived in the town of Leavenworth. The conversion rate for 144 nonresidents was 11.6 percent, whereas the rate for 2,101 residents was only 4.2 percent, one-third as high. These figures include all three observation groups. The annual conversion rates for the nonresidents were consistently higher in all 3 periods, running from 9 to 16 percent com-

Table 3. Histoplasmin conversion rates among residents and nonresidents of the post, Fort Leavenworth, Kans., 1953-55

| Resident status | Number negatives retested | Number converters | Percent converters | Annual conversion rate |
|------------------|---------------------------|-------------------|--------------------|------------------------|
| Nonresident----- | 144 | 10 | 6.9 | 11.6 |
| Resident----- | 2,101 | 58 | 2.8 | 4.2 |
| Total----- | ¹ 2,245 | 68 | 3.0 | 4.8 |

¹ Total returning questionnaires.

Table 4. Frequency of illness in relation to histoplasmin skin test status, Fort Leavenworth, Kans., 1953-55

| Histoplasmin skin test | Total number for whom clinical records were available | Type of illness | | | | | | Total persons reporting illness | |
|------------------------|---|-------------------|---------|--------------------------|---------|------------------|---------|---------------------------------|---------|
| | | Upper respiratory | | Bronchitis and pneumonia | | Gastrointestinal | | | |
| | | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| Negative..... | 2, 140 | 1, 434 | 67 | 271 | 13 | 132 | 6 | 1, 837 | 86 |
| Converter..... | 66 | 38 | 58 | 7 | 11 | 4 | 6 | 49 | 74 |
| Positive..... | 169 | 107 | 63 | 6 | 4 | 10 | 6 | 123 | 73 |
| Total..... | 2, 375 | 1, 579 | 66 | 284 | 12 | 148 | 6 | 2, 009 | 85 |

pared with 2 to 6 percent for the nonresidents. Five of the ten nonresident converters were 11 years old or more, yielding a crude conversion rate of 21 percent compared with 4 percent for residents of the same age. For those under 11 years of age, the crude rate was 4 percent for

the nonresidents as opposed to 2.6 percent for residents.

Changes Accompanying Infection

Table 4 shows the prevalence of different types of illness among all the children for whom clinical records were available, including not only those who became infected (the converters) but those already infected (the positives) and those not infected (the negatives). The illnesses are classified as upper respiratory infection, bronchitis and pneumonia, and gastrointestinal infection.

Sixty-seven percent of the children who were histoplasmin negative had a clinical record of upper respiratory illness, while 58 percent of the converters and 63 percent of the positives reported such illnesses. For bronchitis and

Table 5. X-ray results at the examination in September 1953, Fort Leavenworth, Kans.

| X-ray | Histoplasmin skin test | | | |
|--------------------|------------------------|-----------------|--------------|------------------|
| | Number positive | Number negative | Total number | Percent positive |
| Negative..... | 67 | 1, 416 | 1, 483 | 5 |
| Lesion..... | 12 | 10 | 22 | 55 |
| Calcification..... | 23 | 12 | 35 | 66 |
| Total..... | 102 | 1, 438 | 1, 540 | 7 |

Table 6. X-ray results for children who had more than one X-ray, by histoplasmin skin test status, Fort Leavenworth, Kans., 1953-55

| X-ray reading on initial test and retest films | Histoplasmin skin test | | | | | | Total number |
|--|------------------------|---------|----------|---------|-----------|---------|--------------|
| | Negative | | Positive | | Converter | | |
| | Number | Percent | Number | Percent | Number | Percent | |
| Negative—negative----- | 29 | 91 | 75 | 54 | 43 | 65 | 147 |
| Negative—lesion----- | 0 | 0 | 3 | 2 | 6 | 9 | 9 |
| Lesion—lesion----- | 1 | 3 | 10 | 7 | 3 | 5 | 14 |
| Calcification—calcification----- | 2 | 6 | 52 | 37 | 14 | 21 | 68 |
| Total----- | 32 | 100 | 140 | 100 | 66 | 100 | 238 |

¹ X-rays on 2 converters misfiled and not located.

pneumonia the percentages were 13, 11, and 4, respectively. Thus there was no evidence of a greater frequency of respiratory illnesses among the converters than among either the continuously negative children or those previously infected. It is worth noting, however, that 58 percent of the converters had an upper respiratory illness and that 23 percent, or nearly half of these, had cases lasting 4 days or more.

The results of X-rays taken at the time of the original examination, in September 1953, are given in table 5. Among the children who had negative X-rays, 5 percent were histoplasmin positive. Among those who had lesions, 55 percent were histoplasmin positive, and among those who had calcification, 66 percent were positive to histoplasmin. Thus, frequent association of pulmonary calcification and lesions with positive histoplasmin skin tests is evident. Similar figures were observed for children admitted later to the study.

Table 6 shows the results of X-rays obtained on children who had X-rays both in the initial



Figure 2. W. S. W. M., age 4: Histoplasmin skin and chest X-ray negative in September 1954. In May 1955 histoplasmin skin test positive, 20-mm. induration. Only illnesses were tonsillitis in January 1955 and common cold in March 1955. X-ray taken May 23, 1955, showed pneumonic area in left mid-lung extending out from hilus. Area showed little clearing 3 days later. Serologic tests for histoplasmosis positive May 18, 1955.

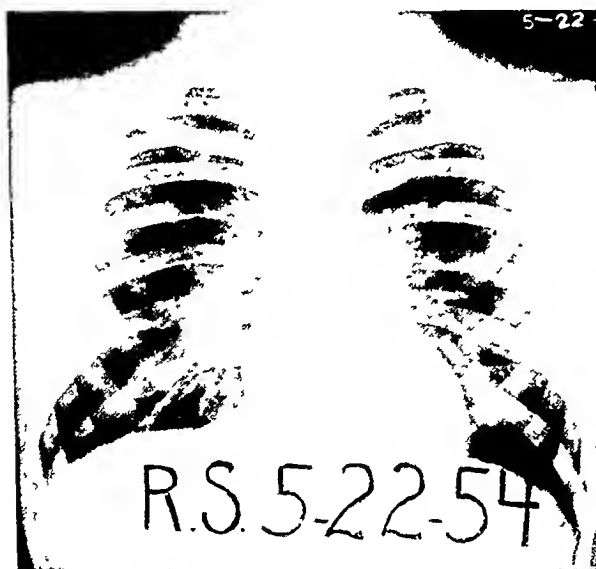


Figure 1. R. S. W. M., age 10: Histoplasmin skin test and chest X-ray negative in September 1953. Histoplasmin skin test positive in May 1954. Chest X-ray May 22, 1954, revealed enlarged right hilar lymph node. Still present July 19, 1954. Three common colds from January to April 1954; bronchitis in November 1953. Serologic tests for histoplasmosis positive May 24, 1954.

examination and on a retest, including those who had X-rays taken because of conversion of the skin tests, the negatives chosen as serologic controls, and the initial positives who had received serologic tests. Of 238 children who had more than one X-ray, 147 were negative on both the initial and the retest X-ray. Fourteen had lesions on both films and 68 showed calcification on both films. The most important happening in this phase of the study was the development by 9 children of a lesion during the period between the 2 X-rays. Six of these nine were among 66 converters, and 3 were among 140 children whose skin tests were positive at the initial examination. Thus almost 10 percent of the converters developed a lesion compared with 2 percent of the initially positive reactors. Two of the lesions which developed among the converters are illustrated in figures 1 and 2.

Table 7 shows the results of serologic tests performed on 320 children in the study. Of

Table 7. Serologic test results for histoplasmin reactor groups, Fort Leavenworth, Kans., 1953-55

| Histoplasmin skin test | Serologic test | | | | |
|------------------------|-----------------|---------------------|-----------------|--------------|------------------|
| | Number positive | Number questionable | Number negative | Total number | Percent positive |
| Negative..... | 3 | 2 | 109 | 114 | 2.6 |
| Converter..... | 13 | 9 | 40 | 62 | 21.0 |
| Positive..... | 10 | 14 | 120 | 144 | 6.9 |
| Total..... | 26 | 25 | 269 | 320 | 8.1 |

¹ 6 converters had no serologic tests.

these, 26, or 8 percent, had positive reactions.

Among the converters 21.0 percent had positive serologic tests, whereas among those remaining histoplasmin negative only 3, or 2.6 percent, had positive tests. Two of the latter three were low titer precipitin tests, a test for which some nonspecificity is known to exist. The remaining test was a minimal positive in the complement fixation test. Five converters had minimal positives in 1 of the 3 serology tests, 2 in the histoplasmin CF test and 3 in the yeast phase CF test. All the other converters yielded a higher response in one or more tests. Among the positive reactors in the first test, 6.9 percent had positive serologic tests.

Table 8 correlates the illness experience and the serologic and X-ray results among the converters. Of the 6 who developed a chest lesion

Table 8. Illness experience and results of X-rays and serologic tests for histoplasmin converters, Fort Leavenworth, Kans., 1953-55

| X-ray | Illness | | | No illness | | | Total |
|-----------------------------|-------------------------|--------------------------------------|-------------------|-------------------------|--------------------------------------|-------------------|-------|
| | Positive serologic test | Negative serologic test ¹ | No serologic test | Positive serologic test | Negative serologic test ¹ | No serologic test | |
| Developed lesion..... | 2 | 1 | 0 | 2 | 1 | 0 | 6 |
| Did not develop lesion..... | 7 | 26 | 2 | 2 | 20 | 3 | 60 |
| No X-ray ² | 0 | 1 | 0 | 0 | 0 | 1 | 2 |
| Total..... | 9 | 28 | 2 | 4 | 21 | 4 | 68 |

¹ Questionable results are included with the negative serologic test.

² X-rays misfiled and could not be located.

during observation, 4 had a positive serologic test and 3 had an illness. Among the 60 who did not develop chest lesions, 7 of the 33 who had illness also had a positive serologic test; only 2 of the 22 with no illness had a positive serologic test. Whenever both illness and chest lesions occurred, serologic tests were usually positive. Children not developing lesions did not show as high a prevalence of positive serologic tests as those who did.

Epidemiology

As already noted in table 3 the conversion rate among residents of the post was about one-third that of nonresidents.

Table 9 shows a comparison of the histoplasmin conversion rate between individuals who visited off the post during the observation period and those who did not. A visit off the

Table 9. Relation of histoplasmin conversion to off-post visits, Fort Leavenworth, Kans., 1953-55

| Visits | Histoplasmin skin test | | |
|-------------------------|------------------------------|-------------------|--------------------|
| | Number of negatives retested | Number converters | Percent converters |
| No visits off post..... | 1,303 | 33 | 2.5 |
| Visits to farms..... | 231 | 11 | 4.8 |
| Other visits..... | 567 | 14 | 2.5 |
| Total..... | 2,101 | 58 | 2.8 |

¹ 10 converters lived off post and were not included.

Table 10. History of pigeons on roof of house in relation to results of histoplasmin skin test, Fort Leavenworth, Kans., 1953-55

| History of pigeons | Number negatives retested | Number converters | Percent converters |
|-------------------------|---------------------------|-------------------|--------------------|
| Winter 1953-54 | | | |
| Pigeons on roof..... | 151 | 15 | 9.9 |
| No pigeons on roof..... | 783 | 22 | 2.8 |
| Total..... | 934 | 37 | 4.0 |
| Summer 1954 | | | |
| Pigeons on roof..... | 86 | 1 | 1.2 |
| No pigeons on roof..... | 202 | 2 | 1.0 |
| Total..... | 288 | 3 | 1.0 |
| Winter 1954-55 | | | |
| Pigeons on roof..... | 190 | 5 | 2.6 |
| No pigeons on roof..... | 669 | 12 | 1.8 |
| Total..... | 859 | 17 | 2.0 |
| All periods combined | | | |
| Pigeons on roof..... | 427 | 21 | 4.9 |
| No pigeons on roof..... | 1,654 | 36 | 2.2 |
| Total..... | 2,081 | 57 | 2.7 |

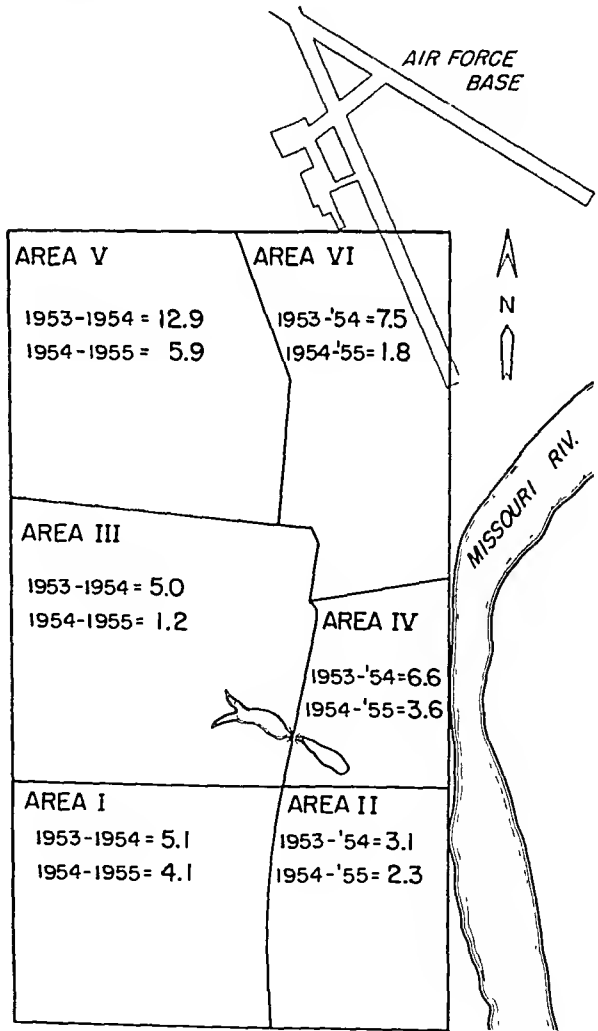
post to a farm was apparently a considerable factor in *Histoplasma* infection, doubling the rate of conversion of the skin test. This has been commented on previously (2). Visits to farms, however, do not explain all the infections which occurred since 47 of the 58 converters denied visiting a farm.

Since there was evidence of infection taking place on the post, further efforts were made to locate a possible source. It is a well-known fact that histoplasmosis is often incurred in old houses, belfries, and other places in which pigeons have been roosting. Since pigeons are plentiful in the old buildings at Fort Leavenworth, the relationship between pigeons roosting on the roof of the houses and histoplasmin conversion was considered. As shown in table 10, the histoplasmin conversion rate among those reporting pigeons on their houses

was more than twice that among the others on the post. This difference was most pronounced during the first observation period, the winter of 1953-54, when 10 percent of the children living in houses where pigeons roosted were histoplasmin positive, compared with 3 percent of those not so associated with pigeons.

Annual conversion rates for different areas of the post for the two winter periods are shown in figure 3. The distribution of converters is not at all uniform, area V showing the highest rates each year. These higher rates were not due solely to the concentration of pigeons men-

Figure 3. Annual histoplasmin conversion rates for five residential areas at Fort Leavenworth, 1953-55.



NOTE: Rates are adjusted to cover 12-month period.

tioned earlier because this concentration covered areas III and IV as well as V.

The extraordinary rate of histoplasmin conversion in area V led to additional investigation, which disclosed that 9 of the 12 converters during the first year lived in a large 3-story apartment house, the Beehive, which sheltered more than 50 families. These 9 converters came from a group of 97 children living in this house who were negative at the time of their first test in September 1953. Eight of the nine converters lived on the third floor, yielding a conversion rate of 27 percent for the children on this floor (table 11). The remaining converter lived on the first floor. In contrast, during the second winter observation period, only 4 of the 72 Beehive residents became histoplasmin positive, and only 1 of them lived on the third floor.

On further inquiry into the difference in conversion rates in the Beehive during the two periods, it was found that a sprinkler system had been installed in the attic of the building during the fall and early winter of 1953. The installation necessitated cutting holes for pipes through the attic floor and the ceilings and floors of the rooms below down to the basement. Furthermore, the attic had a number of broken windows, which permitted pigeons to enter and

nest in the attic. Large amounts of pigeon dung were found scattered throughout the attic, and holes had been bored through some of these areas. In addition, at the time the sprinkler system was installed it was necessary to remove a false floor in the attic, an operation which created a tremendous amount of dust and unquestionably stirred up the pigeon excreta which had been deposited on this false floor. Cultures from pigeon nests in the attic obtained a year or so later, however, showed no evidence of *Histoplasma capsulatum*.

Discussion

The frequency of clinical illness among children converting from negative to positive on the histoplasmin skin test resembled superficially that observed in *Coccidioides* infection. The percentage of converters ill with upper respiratory infection, bronchopneumonia, or bronchitis of at least 4 days' duration was 30 percent in this study, compared with 24 percent with clinical illness in Smith's survey in Army camps (1). Sixty percent of those who became infected with *Coccidioides* and 42 percent of those who became infected with *Histoplasma* showed no upper respiratory illness. However, the incidence of illness among converters at Fort Leavenworth differed little from that of the control groups. Whether or not the same situation prevailed in the *Coccidioides* study cannot be determined because no studies on controls were done.

That *Coccidioides* infection is sometimes even less manifest than in Smith's report is indicated by the following quotation from a presentation at the Coccidioidomycosis Conference, Phoenix, Ariz., February 11-13, 1957, by Dr. Paul G. Hugenholz, formerly chief, Medical Service, Williams Air Force Base, Ariz.: "Forty-four converters to the coccidioidin skin test were observed among approximately 200 skin test negative recruits retested at 3-month intervals. Only 1 of these 44 is a clinically recognized case, and 5 other men had only a 'cold.' Indeed the illness was so vague that I would classify 43 of the 44 as 'inapparent infections'."

The similarity in frequency of illness among the converters and the control groups consisting of previously infected children and those

Table 11. Histoplasmin conversion rates according to floor of apartment house (Beehive), Fort Leavenworth, Kans., 1953-55

| Floor | Number negatives retested | Number converters | Percent converters |
|----------------|---------------------------|-------------------|--------------------|
| Winter 1953-54 | | | |
| 1st..... | 37 | 1 | 3 |
| 2d..... | 30 | 0 | 0 |
| 3d..... | 30 | 8 | 27 |
| Total..... | 97 | 9 | 9 |
| Winter 1954-55 | | | |
| 1st..... | 27 | 3 | 11 |
| 2d..... | 17 | 0 | 0 |
| 3d..... | 28 | 1 | 4 |
| Total..... | 72 | 4 | 6 |

continuously negative at Fort Leavenworth is probably due to the infrequency of the *Histoplasma* infections (only 68 children among 2,662), compared with the frequency of other causes of illness; only 2.8 percent of the children became infected with *Histoplasma*, but 85 percent showed some type of illness. It may also be that *Histoplasma* infections in children are somewhat milder than infections in older people, which on the whole have been rather severe as seen in reports of epidemics of histoplasmosis. Perhaps dosage may be the important difference. It is important to note that both in the development of chest lesions and in the serologic tests a definite difference could be detected between the infected group and the control group. Certainly there is adequate evidence in the literature to substantiate the potential seriousness of both epidemic and sporadic histoplasmosis. One can only conclude that under the conditions of this study *Histoplasma* infections were not frequent enough or severe enough, or otherwise sufficiently different, so as to be distinguished from the other infections seen in the controls of similar age and with similar exposure.

The study indicates a direct relationship between the incidence of histoplasmin skin test conversions and residence off the post in Leavenworth and nearby Missouri and Kansas towns, visits to farms regardless of location, and association with pigeons. Conversion rates were especially high during the first year of the study among the top-floor residents of one large apartment house, where a sprinkler system was being installed. The remodeling required by installation of this equipment undoubtedly scattered pigeon dung deposited in the attic. The rates of infection were markedly lower the second year of the study, after the remodeling had been completed. Although *H. capsulatum* could not be demonstrated in material collected from the attic at a later date, the epidemiological data definitely point to dissemination of the infection from dry dust and pigeon manure stirred up by the remodeling.

Comparison of the prevalence of histoplasmin sensitivity among these Army children with that of natives of the area is interesting.

A previous study has shown that the rate among the natives is much higher; it is about 47 percent at ages 7-8 years, as compared with about 5 percent for the Army children of these ages. The difference is further brought out in table 3, which shows that nonresidents of the post (most of whom lived in Leavenworth) had a histoplasmin conversion rate three times higher than residents of the post. Also the rates of conversion are higher among the older children than among the younger ones (table 2). This may be associated with the fact that all the children, even those living on the post, attend high school in Leavenworth and are thus exposed to the factors which account for the high local rate.

Summary

Clinical illness, development of chest lesions, and serologic changes accompanying infection with *Histoplasma capsulatum* were studied in children of United States Army personnel stationed at Fort Leavenworth, Kans. Of 2,662 with a negative reaction to the histoplasmin skin test on the first examination, 68 had a positive reaction to a second test 5 to 8 months later. Uninfected children, as well as those previously infected, served as controls for these converters.

Illness accompanying infection did not occur frequently enough to be separated from the routine upper respiratory illnesses occurring among the controls. This lack of definition may have been due to the infrequency of *Histoplasma* infections in these children (only 4 percent per year) in comparison with the frequency of upper respiratory infections (58 percent for the converters and 66 percent for the rest of the children in the study).

Chest lesions, evident on X-rays, developed more frequently among the converters than among the controls. Similarly, serologic tests were more often positive among the converters, and there was a definite relationship of serologic test results to illness and the development of chest lesions.

Epidemiological observations indicate that *Histoplasma* infections among these Army children resulted from several of various potentially infectious factors. These may be listed in the order of importance as living off the post,

visits to farms, living in a house frequented by pigeons, and, finally, living in a house where exposure to pigeon excreta unquestionably occurred.

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publications

Public Sewage Treatment Plant Construction, 1956

PHS Publication No. 549. 1957. 15 pages. 15 cents.

Fifth in a series, this report gives the number and amount of contracts awarded for the construction of sewage treatment plants by municipalities in 1956. The awards are broken down by 15 major drainage basins of the United States, by population groups, and by size of contract. Place, type of construction, and cost of each contract are listed in the appendix.

The effects of the Federal grant program under Public Law 660 (84th Cong.) are not reflected since there has not been sufficient time to determine them.

20th Anniversary of the National Cancer Institute—Commemorative Symposium

Journal of the National Cancer Institute, Vol. 19, August 1957. \$2.00

Members of the staff of the National Cancer Institute, Public Health Service, have contributed special articles for this commemorative issue. Beginning with the text of the National Cancer Institute Act of August 5, 1937, they review the

development and accomplishments of cancer research and programs for cancer control.

Present and former members of the National Advisory Cancer Council, present Institute staff, and deceased staff members are listed in the appendix.

A Comprehensive Program for Water Pollution Control for the Meramec River Basin

Water Pollution Series No. 72. PHS Publication No. 553. 1957. 7 pages.

One of a series presenting comprehensive pollution abatement programs developed by the States and adopted by the Surgeon General in accordance with the new Federal Water Pollution Control Act (P. L. 660, 84th Cong.), this publication summarizes the program developed by the Missouri Division of Health and the Public Health Service to control pollution in the Meramec River Drainage Basin (eastern Missouri).

The program provides an objective plan for citizens of the area and city officials and industrial leaders, farmers, fishermen, conservationists, and others. Projects (new plants, replacements, enlargements, additions) required to bring water pollution under control in the Meramec

River Basin are listed. Other recommendations relate to the operation of existing municipal and industrial waste treatment works, provision of adequate sanitary facilities and practices at camps and recreation centers, and control of new and increased sources of pollution.

Barbiturates As Addicting Drugs

PHS Publication No. 545. 1957. Folder. \$2.50 per 100.

Prepared by the National Institute of Mental Health, Public Health Service, this folder points out the dangers of uncontrolled, habitual use of barbiturates. It describes the symptoms of barbiturate intoxication, how experiments have proved that addiction occurs, what kind of treatment is indicated, and why further research is needed.

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared by other Federal agencies.

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X-ray Case-Finding Programs in Tuberculosis Control

SINCE the 1940's, mass radiography of the chest has been a fundamental technique in the detection of tuberculosis in this country. In 1956 approximately 70,000 new active cases of tuberculosis were discovered, a substantial portion of the total by this means.

As originally constituted, mass X-ray surveys had communitywide application and were designed to reach from 70 to 80 percent of the adult population within a limited time. The rationale that motivated this method of attack was that most of the unknown active cases in the population would be discovered and eventually isolated, treated, and rehabilitated, and that presymptomatic disease would be discovered at a stage before irreparable lung damage had been done.

The only limitation or selection imposed upon these communitywide survey enterprises, in actual practice, was a minimum age. Persons younger than 15 years of age were usually excluded because of both the difficulty of obtaining satisfactory films and the low yield of cases among children. The working assumption was that tuberculosis was a problem of the general adult population and called for widescale intensified attack.

In the last 15 years the tuberculosis problem has changed radically. There are areas of the country where active tuberculous disease is almost nonexistent. And there are many other areas where tuberculosis continues to be a serious public health and medical problem. There are a number of special groups that carry a heavy burden of tuberculosis and constitute a fertile source of future cases. Thus, tuberculosis continues to be a stubborn problem, and X-ray case finding remains a primary factor in its solution. However, the emphasis has shifted

as the tuberculosis control challenge has changed.

Perceiving the nature of this change, the Public Health Service has been supporting for some time the selective use of mass X-ray survey facilities and has promoted their application in population groups at high risk of infection and disease, such as, hospital admissions, patients and employees in mental hospitals, inmates of correctional institutions, low economic groups, particularly those in slum areas, migrant laborers, alcoholics, and others. Contacts of open cases and persons with symptoms typical of tuberculosis constitute other groups that should receive prime attention in case-finding activities.

In applying the principle of selectivity, the yield of new cases should be a strongly influencing factor in establishing priorities for survey programs. Nevertheless, it is recognized that, within the identifiable types of population groups suitable for X-ray case finding, there are wide ranges in the number and rate of discoverable cases. Therefore, no nationwide priority can be established on the basis of gross categories of population. Necessarily, prior-

This statement, approved by Surgeon General Leroy E. Burney, was prepared with the advice of:

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ities should be determined by the epidemiological demands of the particular local situation. For example, the range of rates of newly discovered cases in correctional institutions indicates that this population group may deserve a very high or a very low priority, depending upon the particular local situation.

Selection of areas of case-finding activity should also be determined by the quantity and quality of available followup, diagnostic and treatment facilities, cost, availability of personnel, and by the community's potentiality for making the maximum utilization of survey findings. When X-ray screening is planned for any group, it is essential that facilities for differential diagnosis be provided so that virtually all clinically significant cases of tuberculosis will promptly come under medical care. Where such facilities are limited, X-ray screening programs should be so restricted as to insure adequate diagnosis and medical care of new cases found.

In low-prevalence groups, tuberculin skin testing is useful as a first step in case finding. X-ray activities could thus be restricted to reactors to tuberculin. As a result, the necessity of screening the whole population would be obviated.

In consequence, the Service proposes that every community evaluate on a continuing basis its tuberculosis problem, its specific needs and its resources, so that X-ray surveys may have maximum effect in terms of number of cases found, the reduction of the reservoir of unknown infectious cases, and, through adequate and enduring followup activities, the breaking of chains of infection.

For many years it has been known that there is a risk of excessive radiation exposure involved in the use of X-ray machines. Current findings in this field that emphasize the significance of relatively low-level radiation exposure now serve to focus attention on the need to maintain and operate X-ray equipment in such a way as to eliminate all unnecessary radiation.

To achieve this purpose, the Public Health Service recommends the following procedures: Systematic inspection should be made of all X-ray case-finding equipment, so that radiation exposure to the population may be reduced as

much as possible. Photofluorographic X-ray equipment should be inspected prior to the beginning of a survey and at frequent intervals thereafter. Of particular importance in this connection are: (a) permanent installation of the proper size cone, so as to limit the field of radiation to the area of the fluoroscopic screen of the photofluorograph; (b) the interposition of a filter of at least $2\frac{1}{2}$ millimeters of aluminum in the useful X-ray beam to eliminate the soft radiation; (c) radiation levels at locations where technical and other personnel are situated and where incoming and outgoing examinees are stationed, consistent with the standards set forth in the National Bureau of Standards Handbooks 59 and 60.

A committee of experts has had under review for some time the problems associated with radiation exposure. It is their considered judgment that the risks inherent in such exposure, although important, are relatively small compared to the very great benefits to be achieved from chest X-ray case-finding programs when conducted within the principles set forth in this document.

Summary

The following, then, are the guiding principles that unify the policy of the Public Health Service as it bears upon tuberculosis X-ray case-finding activities:

1. Mass radiography of the chest, operated under competent auspices, is a fundamental technique in the detection of tuberculosis.

2. Mass X-ray case finding should be applied selectively in groups at high risk of tuberculosis infection and disease.

3. All tuberculosis X-ray survey programs should have the prior approval of the applicable State or local health department.

4. Consideration should be given to the tuberculin test as an initial screening device in low prevalence groups.

5. Every community should evaluate on a continuing basis its tuberculosis problem, needs, and resources, so that local X-ray surveys may have efficient use and maximum effect.

6. Adequate safeguards should be utilized to protect all persons from unnecessary radiation.

Personnel Time in Nursing Homes of Washington State

ELIZABETH LAMBERTY TUCKER, R.N., M.N., and MILDRED A. SNYDER, M.P.H.

THE PLIGHT of many older citizens has created a phenomenal interest in the role of the nursing home in the care of the sick and the aged. This interest has been fanned by the rising cost of long-term hospitalization, advances in medical care and rehabilitation, and changing cultural patterns and age distribution of the population. Official health and welfare agencies are devoting more time and attention to nursing homes. The embarrassing lack of information about present practices in these homes, however, has been a severe handicap in planning construction and licensing programs.

A national inventory in 1954 reported that Washington had 3.6 beds per 1,000 population in nursing homes providing skilled nursing care, or nearly 40 beds per 1,000 population over 65 years of age (1). These rates are higher than the rates for any other State. Washington was the only State in 1954 having more nursing home beds (8,964) than general hospital beds (8,423).

In 1951 a nursing home licensing law was enacted by the State legislature, and in that same year rules, regulations, and standards were adopted by the Washington State Board of

Health (2). A nursing home is defined in the law as "any home, place or institution which operates or maintains facilities providing convalescent or chronic care, or both, for a period in excess of 24 consecutive hours for three or more patients not related by blood or marriage to the operator, who by reason of illness or infirmity are unable properly to care for themselves."

The nursing home licensing law is administered jointly by the State department of health and 17 of the 37 local health departments. Public health nurses and sanitarians, under the direction of the local health officer, visit homes to assist and consult with the operator and to enforce the law and the rules and regulations. Where the local health department staff is small, personnel from the State department of health work directly with the nursing homes. In other localities, a State team consisting of a nurse and a sanitarian works with local health department staffs and arranges for additional consultant services in architecture, nutrition, or management, as needed. During 1955 there was an average of 4 public health nursing visits and 5 sanitarian visits to each home by State or local personnel.

The present study of personnel in nursing homes in Washington, undertaken in 1956, had three objectives:

1. To collect and analyze data on the number and kinds of personnel employed in the various types of nursing homes.

2. To develop from the analysis staffing guides and other related material for the various sizes and types of homes. Such guides can be used by public health nurses and nursing

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Table 1. Washington State Department of Public Assistance requirements for skilled nursing personnel in nursing homes, by shift, and monthly rate of payment for patient care, 1956¹

| Type of home | Shift (7 days per week) | | | Monthly rate paid |
|----------------|-------------------------|--------------|--------------|-------------------|
| | Day | Evening | Night | |
| Group I..... | One RN..... | One RN..... | One LPN..... | \$180 |
| Group II..... | One RN..... | One LPN..... | One LPN..... | 145 |
| Group III..... | One RN or one LPN..... | None..... | None..... | 115 |
| Group IV..... | One LPN..... | None..... | None..... | 90 |

¹ In addition to the skilled nursing personnel listed, sufficient additional personnel to care adequately for the type and number of patients in the home are required.

NOTE: RN=registered nurse; LPN=licensed practical nurse.

home operators in interpreting the following section of the Laws, Rules, Regulations, and Standards, which applies to all nursing homes: "The nursing service in the home shall be the responsibility of a person employed full time as a registered nurse or a licensed practical nurse, and who has had at least 2 years' experience. Additional personnel shall be employed when the size of the service requires it, in order to give adequate care to patients."

3. To provide data that can be used to compare nursing home practice in the State of Washington with that in other States.

Collection of Data

Every year, as part of the application for renewal of license, due July 1, each nursing home must complete a weekly employee work schedule. Reported on this form are identifying data on the home, names of all employees and of the operator, hours and time of work, and type of position held by each employee, together with the license number of each registered nurse and licensed practical nurse. Included on the application for renewal are data on bed capacity, number of patients, type of home, and average daily census. From forms submitted in 1956, covering a 1-week period in May of that year, data were obtained for the study. With the assistance of the public health statistics section of the State department of health, the information was coded, punched on tabulating cards, and summarized.

Since the data were required for renewal of the nursing home license, information was obtained on all nursing homes. Similar reports

have been required for the past 6 years, and frequently the data have been verified during regular public health nursing visits to the homes. For this reason, the data collected appeared to be more complete and accurate than would be expected from a questionnaire. The reporting of licensed nursing personnel is believed to be reliable because the license number for each nurse had to be included and could be verified. However, the work classification for other types of personnel, particularly in small homes, was difficult to do and probably not too accurate.

In May 1956 there were 9,680 nursing home beds in the State. The 558 beds located in nursing home units in general hospitals were excluded from the study. Information was collected from 300 licensed nursing homes and homes for the aged, which provided 9,122 beds for patient care.

Types of Homes and Patients

The Washington State Department of Public Assistance has established four groups of nursing homes as a basis of payment for nursing home care of welfare patients. A home is classified as I, II, III, or IV according to the qualifications and number of skilled nursing personnel employed in the home. The requirements for skilled nursing personnel and the rate of payment for patient care for each type of home are shown in table 1.

Medical examiners, employed by the department of public assistance, examine welfare patients, classify them into four groups, and recommend the type of nursing home care

needed. Arrangements are then made for the care of patients in homes that have the appropriate skills available. In general, patients in the four types of homes meet the following criteria:

The group I patient is usually confined to bed unless lifted out, must be fed, or helped in feeding, and cannot assist in bedmaking, bathing, or caring for himself. He may be incontinent, in need of special diet, or in need of skilled nursing service such as intravenous and oxygen therapy or special dressings.

The group II patient is usually confined to bed unless lifted out, can assist with bedmaking by rolling from side to side, and may be capable

of feeding himself. He may, however, be incontinent and require parenteral medication or a special diet.

The group III patient may be on bed rest but have bathroom privileges, feed himself, and have a minor modification of a regular diet, or he may be ambulatory and require only semi-professional nursing service.

The group IV patient is usually ambulatory, sitting up frequently, and may require simple nursing services such as oral medication and routine observation. He may present a mild mental confusion.

Pertinent to analysis of the data on personnel in Washington's nursing homes are background

Table 2. General characteristics of nursing homes in Washington, May 1956

| Type and size (in beds) | Number of homes | Number of beds | Number of patients | Average occupancy (percent) | Average size (beds) |
|-----------------------------|-----------------|----------------|--------------------|-----------------------------|---------------------|
| Group I..... | 97 | 4, 180 | 3, 995 | 95. 6 | 43 |
| 12-20..... | 13 | 227 | 213 | 93. 8 | 17 |
| 21-30..... | 18 | 489 | 433 | 88. 5 | 27 |
| 31-40..... | 20 | 709 | 668 | 94. 2 | 35 |
| 41-60..... | 31 | 1, 515 | 1, 452 | 95. 8 | 49 |
| 61-129..... | 15 | 1, 240 | 1, 229 | 99. 1 | 83 |
| Group II..... | 28 | 926 | 882 | 95. 2 | 33 |
| 12-40..... | 21 | 537 | 519 | 96. 6 | 26 |
| 41-77..... | 7 | 389 | 363 | 93. 3 | 56 |
| Group III..... | 151 | 3, 552 | 3, 334 | 93. 9 | 24 |
| 4-20..... | 72 | 947 | 855 | 90. 3 | 13 |
| 21-30..... | 54 | 1, 329 | 1, 222 | 91. 9 | 25 |
| 31-40..... | 13 | 464 | 482 | 103. 9 | 36 |
| 41-60..... | 6 | 285 | 283 | 99. 3 | 48 |
| 61-117..... | 6 | 527 | 492 | 93. 3 | 88 |
| Group IV ¹ | 12 | 245 | 209 | 85. 3 | 20 |

¹ Ranged in size from 6 to 45 beds.

Table 3. Number of persons employed in nursing homes, by type of home, Washington, May 1956

| Type of personnel | Total | Group I | Group II | Group III | Group IV | Unelassed |
|--|--------|---------|----------|-----------|----------|-----------|
| Total..... | 4, 074 | 2, 090 | 393 | 1, 323 | 60 | 208 |
| Registered nurses ¹ | 508 | 365 | 51 | 66 | 4 | 22 |
| Licensed practical nurses ¹ | 462 | 188 | 54 | 183 | 8 | 29 |
| Nurse aides and orderlies..... | 1, 591 | 845 | 149 | 508 | 10 | 79 |
| Operators..... | 158 | 54 | 12 | 72 | 10 | 10 |
| Housekeeping personnel..... | 334 | 151 | 32 | 126 | 11 | 14 |
| Dietary personnel..... | 669 | 316 | 64 | 246 | 10 | 33 |
| Laundry workers..... | 115 | 63 | 14 | 30 | 2 | 6 |
| Maintenance and gardening personnel..... | 180 | 76 | 13 | 74 | 5 | 12 |
| Other personnel..... | 57 | 32 | 4 | 18 | 0 | 3 |

¹ Includes 58 operators who are registered nurses and 91 operators who are licensed practical nurses. Some homes reported more than 1 operator.

data relating to size of the homes and other general characteristics. Such data for the 288 homes classified into one of the four groups are shown in table 2. Group I and Group III homes far outnumbered the other two types. Homes in group I tended to be larger than those in any other group, and they had more patients than even the more numerous but generally smaller homes in group III. All groups had almost a full complement of patients, the average occupancy ranging from 85.3 percent for group IV homes to 95.6 percent for group I homes.

Most of the patients in the nursing homes were welfare patients: The proportion in group I was about three-fourths and in each of the other three groups about four-fifths. The majority of the welfare patients in each type of home met the criteria for that type. For example, nearly two-thirds of the welfare patients in group I homes had a group I classification, while the other third were classified group II, group III, or group IV.

Twelve of the homes, providing 219 beds, were not classified by the department of public assistance. Although the number of personnel in these homes is reported, data on personnel time are not presented.

Types of Personnel

In May 1956, 4,074 persons were employed full time or part time in the 300 nursing homes in this study (table 3). Nurse aides and orderlies were the largest group, about 40 percent. Dietary personnel (cooks, kitchen helpers, dishwashers, and pantry girls) were the second largest group. There were 508 registered nurses and 462 licensed practical nurses employed during the study week. Two-thirds of these skilled

nursing personnel were employed in group I and group II homes, where the patients generally require 24-hour skilled nursing care and supervision. There were 307 persons reported as operators of nursing homes, of whom 58 were registered nurses and 91 were licensed practical nurses. The average number of hours worked during the study week for all employees, including both part-time and full-time personnel, was 37.7 hours.

The percentage of employees who were registered nurses varied from 17.5 in group I homes to 5.0 in group III homes (table 4). In group I and in group II homes, about one-fourth of the employees were skilled nursing personnel; in group III and in group IV homes, nearly one-fifth were in this category. Approximately two-fifths of the employees are classified as nurse aides and orderlies in all types of homes, except group IV, where only 16.7 percent are so classed. More than 60 percent of the employees in group IV homes were classified as "all other."

Personnel Time Per Home

The data reported on the number of hours of employee time were analyzed separately for each group of homes and are presented in that fashion in this section. Although comparisons can be drawn among the groups, each type is considered here as a distinct entity.

Group I

The average number of hours of employee time per home per week varied from 394 for homes with 12-20 beds to 1,393 for homes with 61-129 beds (table 5). Total employee time increased as the size of the home increased. However, registered nurse time did not increase

Table 4. Percentage distribution of personnel employed in nursing homes according to type of personnel, by type of home, Washington, May 1956

| Type of personnel | Total | Group I | Group II | Group III | Group IV | Unclassed |
|--------------------------------|-------|---------|----------|-----------|----------|-----------|
| Total..... | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Registered nurses..... | 12.5 | 17.5 | 13.0 | 5.0 | 6.7 | 10.6 |
| Licensed practical nurses..... | 11.3 | 9.0 | 13.7 | 13.8 | 13.3 | 13.9 |
| Nurse aides and orderlies..... | 39.1 | 40.4 | 37.9 | 38.4 | 16.7 | 38.0 |
| All other..... | 37.1 | 33.1 | 35.4 | 42.8 | 63.3 | 37.5 |

Table 5. Average number of personnel hours per home per 7-day week, according to type and size of home, Washington, May 1956

| Type and size (in beds) | Total | RN | LPN | Aide and orderly | Other |
|-------------------------|-------|-----|-----|------------------|-------|
| Group I..... | 795 | 132 | 77 | 333 | 253 |
| 12-20..... | 394 | 115 | 59 | 87 | 133 |
| 21-30..... | 509 | 111 | 69 | 172 | 157 |
| 31-40..... | 672 | 115 | 86 | 269 | 202 |
| 41-60..... | 919 | 141 | 73 | 403 | 302 |
| 61-129..... | 1,393 | 177 | 99 | 679 | 438 |
| Group II..... | 574 | 74 | 83 | 218 | 199 |
| 12-40..... | 453 | 67 | 80 | 153 | 153 |
| 41-70..... | 938 | 92 | 94 | 413 | 339 |
| Group III..... | 346 | 70 | | 134 | 142 |
| 4-20..... | 221 | 64 | | 67 | 90 |
| 21-30..... | 376 | 64 | | 170 | 142 |
| 31-40..... | 478 | 67 | | 219 | 192 |
| 41-60..... | 656 | 88 | | 320 | 248 |
| 61-117..... | 973 | 174 | | 255 | 544 |
| Group IV..... | 223 | 49 | | 37 | 137 |

RN=registered nurse; LPN=licensed practical nurse.

in this manner. The number of registered nurse hours per home per week in the 3 size groups with 40 beds or fewer averaged essentially the same as the requirement of 112 hours (day and evening shifts 7 days a week). Homes in the 2 size groups with 41 beds or more exceeded this requirement. In all sizes of homes, the requirement of 56 hours of licensed practical nurse time (night shift 7 days a week) was exceeded.

In group I homes, the duties of the registered nurse are largely those of supervision and teaching of the other nursing staff and, in some homes, include managerial or administrative tasks. Direct service to patients generally consists of administering medications, performing highly technical nursing procedures, and observing the patients. Since the pattern of registered nurse staffing appeared to be related to the requirement rather than to the size of the home or the functions of the nurses, further analysis of registered nurse hours was made (table 6).

Fifteen of the group I homes did not meet the minimum of 112 hours of registered nurse time; four of these homes had 41 beds or more. Nineteen group I homes, 16 of which were larger than 40 beds, reported more than 155 hours of registered nurse time per week. While the

registered nurse hours per home ranged from 50 to more than 215, 42 homes reported between 110 and 124 hours, approximately the required amount. From the work schedules, it was noted that a number of homes employed 2 full-time registered nurses and 1 or 2 part-time registered nurses for relief on the day and evening shifts. The specific requirement appears to have a great

Table 6. Registered nurse hours reported for the study week by group I homes, by size of home, Washington, May 1956

| RN hours | Number of homes | | |
|------------------|-----------------|------------------|-----------------|
| | Total | 40 beds or fewer | 41 beds or more |
| Total..... | 97 | 51 | 46 |
| 50-64..... | 3 | 3 | 0 |
| 65-79..... | 2 | 2 | 0 |
| 80-94..... | 1 | 0 | 1 |
| 95-109..... | 9 | 6 | 3 |
| 110-124..... | 42 | 32 | 10 |
| 125-139..... | 12 | 4 | 8 |
| 140-154..... | 9 | 1 | 8 |
| 155-169..... | 8 | 2 | 6 |
| 170-184..... | 2 | 0 | 2 |
| 185-199..... | 2 | 1 | 1 |
| 200-214..... | 4 | 0 | 4 |
| 215 or more..... | 3 | 0 | 3 |

NOTE: Includes registered nurse operators; no deductions were made for managerial duties.

influence on the employment of registered nurses in homes with 40 beds or fewer, but larger homes tend to employ more registered nurses than the minimum.

To remove the effect of the size of the home in analyzing registered nurse time, the hours reported for each home were divided by the number of beds. The average number of hours of registered nurse time per bed per 7-day week is shown in the tabulation below. The range was rather wide, but nearly two-thirds of the homes reported between 2.0 and 3.9 hours of registered nurse time per bed.

| <i>Hours of RN time per bed per 7-day week</i> | <i>Number of homes</i> |
|--|----------------------------|
| Less than 2----- | 9 |
| 2.0-2.9----- | 31 |
| 3.0-3.9----- | 31 |
| 4.0-4.9----- | 11 |
| 5.0-5.9----- | 7 |
| 6.0-6.9----- | 3 |
| 7.0-7.9----- | 0 |
| 8.0 or more----- | 5 |
| Total----- | 97 |

NOTE: Includes registered nurse operators. No deductions were made for managerial duties.

Group II

The average number of hours of employee time per home per week was 574. Of this amount, 74 hours was registered nurse time and 83 hours was licensed practical nurse time (table 5). The public assistance requirement is 56 hours of registered nurse time and 112 hours of licensed practical nurse time per week. Thus the study data indicate that registered nurses were being employed rather than licensed practical nurses in some homes.

Most group II homes aspire to a group I classification, but because of physical arrangements within the home and staffing requirements, a group I classification is not always feasible or desirable.

Group III

The public assistance requirement for group III homes allows either a licensed practical nurse or a registered nurse to be in charge of nursing service. Forty-eight of these homes reported registered nurses and 103 reported licensed practical nurses in this position. In 41 of the homes the operator was either a registered nurse or a licensed practical nurse

and supplied the only skilled nursing time reported.

The homes in group III reported an average of 346 hours of employee time per home per week, 70 hours of which was skilled nursing time (table 5). The number of hours ranged from 64 for homes with 4-20 beds to 174 for homes larger than 60 beds. In all size groups the requirement for skilled nursing time was exceeded. As in group I homes, the amount of skilled nursing time did not increase as the size of the home increased for homes with 40 beds or less. However, homes with more than 40 beds did have additional skilled nursing staff.

Group IV

The 12 homes in group IV averaged 223 hours of employee time per home per week, much less than the average for any other of the 3 groups (table 5). There was an average of 49 hours of skilled nursing time and 37 hours of nurse aide and orderly time per home per week.

Some of the group IV homes were formerly boarding homes for the well aged. When some of the residents in such a home became ill, nursing staff was added and the home applied for and received a nursing home license.

Skilled Nursing Hours per Shift

In group I homes a registered nurse is required to be on duty at all times during the day and evening shifts. Nearly three-fourths of the hours reported for registered nurses in these homes were on these shifts (table 7). The distribution of registered nurse hours is similar for group II homes, although the proportion was slightly higher for the day shift. Approximately two-fifths of the licensed practical nurse time was for the night shift in both group I and group II homes.

In group III homes, either a registered or a licensed practical nurse is required to be on duty at all times during the day shift. However, 17 percent of the skilled nursing time was reported on the evening and night shifts. All of the skilled nursing time in group IV homes was reported for the day shift.

Nursing Time per Patient

To compare further the four groups of homes, the average number of hours of nursing

Table 7. Percentage distribution of skilled nursing hours according to shift, by type of home, Washington, May 1956

| Shift | Group I | | Group II | | Group III | Group IV |
|---------------------------|-------------------|-------------------|------------------|-------------------|--------------------------|-----------------------|
| | RN (12,834 hours) | LPN (7,495 hours) | RN (2,065 hours) | LPN (2,329 hours) | RN or LPN (10,494 hours) | RN or LPN (586 hours) |
| All shifts----- | 100. 0 | 100. 0 | 100. 0 | 100. 0 | 100. 0 | 100. 0 |
| Day----- | 40. 3 | 28. 2 | 47. 9 | 27. 6 | 68. 9 | 84. 8 |
| Evening----- | 31. 2 | 11. 3 | 31. 1 | 19. 2 | 7. 9 | 0 |
| Night----- | 9. 4 | 40. 2 | 5. 8 | 37. 1 | 9. 2 | 0 |
| Relief ¹ ----- | 15. 0 | 17. 1 | 11. 5 | 15. 7 | 11. 4 | 0 |
| Not stated----- | 4. 1 | 3. 2 | 3. 7 | . 4 | 2. 6 | 15. 2 |

¹ Breakdown by time of day not given. NOTE: RN=registered nurse; LPN=licensed practical nurse.

time available per patient per 7-day week was computed for each home. Nursing time includes the hours reported for registered nurses, licensed practical nurses, nurse aides, and orderlies. Group I homes averaged slightly more than 13 hours of nursing time per patient per week, with a range of from 2 hours to more than 26 hours (table 8). More than one-third of the group I homes reported 12.0 to 13.9 hours. In group II homes, the average num-

ber of hours per patient per week was nearly 12, and the range was 6.0 to 23.9 hours. In group III homes, the average was slightly more than 9 hours per patient, with a range of from less than 2 hours to more than 26 hours. More than two-fifths of the group III homes reported 8.0 to 9.9 hours. The average for group IV homes was about 6, with a maximum of 9.9.

Table 8. Average number of nursing hours¹ per patient during the study week, by type of home, Washington, May 1956

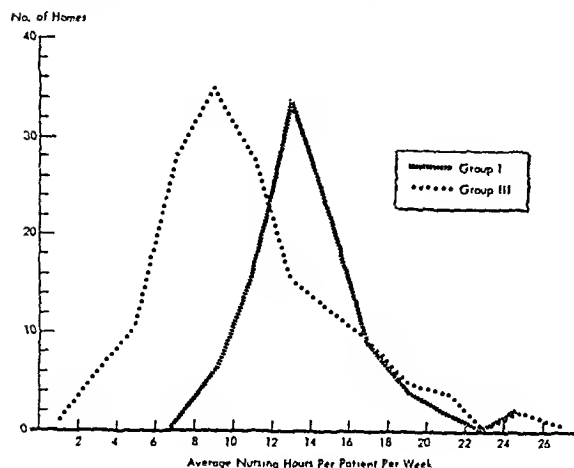
| Hours per patient | Number of homes | | | |
|-------------------|-----------------|----------|-----------|----------|
| | Group I | Group II | Group III | Group IV |
| Total---- | 97 | 28 | 151 | 12 |
| 0-1.9----- | 0 | 0 | 1 | 1 |
| 2.0-3.9----- | 1 | 0 | 6 | 3 |
| 4.0-5.9----- | 0 | 0 | 11 | 2 |
| 6.0-7.9----- | 0 | 2 | 28 | 2 |
| 8.0-9.9----- | 6 | 3 | 35 | 4 |
| 10.0-11.9----- | 16 | 9 | 28 | 0 |
| 12.0-13.9----- | 34 | 8 | 16 | 0 |
| 14.0-15.9----- | 22 | 2 | 12 | 0 |
| 16.0-17.9----- | 9 | 3 | 1 | 0 |
| 18.0-19.9----- | 4 | 0 | 5 | 0 |
| 20.0-21.9----- | 2 | 0 | 4 | 0 |
| 22.0-23.9----- | 0 | 1 | 0 | 0 |
| 24.0-25.9----- | 2 | 0 | 2 | 0 |
| 26 or more----- | 1 | 0 | 2 | 0 |

Some group III homes provided more nursing time per patient per week than some group I homes (fig. 1). The variation among homes in all groups was extensive. These findings may indicate, for example, that some group III patients have the same nursing needs as group I patients. Or they may indicate that group III nursing staff may not work as efficiently as the staff in group I homes where care is directed by skilled nursing personnel and which are generally larger and perhaps better designed for nursing care. Further interpretation, however, must await additional information on patients and their need for nursing care.

Two recent publications report data on hours of nursing time per patient in nursing homes or other institutions for the chronically ill or disabled. Although these cannot be compared directly with the data for the Washington nursing homes because of differences in study methods, in types of institutions included, and in definitions of terms, it is of interest to review them here. One of the reports, from a

¹ Includes the time of registered nurse staff and operators, licensed practical nurse staff and operators, and aides and orderlies; no deductions were made for managerial duties.

Figure 1. Average nursing hours per patient per week, group I and group III nursing homes, Washington, May 1956.



study of Florida nursing homes in 1955, gives 16.1 as the average number of hours of nursing service per patient per week. In this study the actual time spent by employees giving nursing service to patients was counted (3). In the other publication, a book by Edna Nicholson (4), this information appears: "... the average amounts of bedside service time required to maintain minimum adequate personal attention and nursing care for the residents varied from approximately 1.25 hours per patient per day in the nursing department of an institution where all the patients were ambulant and comparatively self-sufficient to more than 5 hours per patient per day in two institutions filled with seriously disabled people." Nicholson also states that an average of 22.89 hours of nursing staff time per patient per week was required for minimum adequate institutional care for chronically ill and disabled patients.

In order to evaluate adequately the relationship between skilled nursing time and other nursing time in the four groups of homes, hours reported for the three types of nursing personnel have been changed into minutes per patient per day (table 9). Group I homes provided an average of 44 minutes of skilled nursing time per patient per day, of which 28 minutes was registered nurse time; group II homes provided approximately the same amount of skilled nursing time, 43 minutes, but had less registered nurse time, 20 minutes. Group III

and group IV homes provided considerably less skilled nursing time than the other two groups. Group III homes provided an average of 27 minutes, while group IV homes provided 24 minutes of skilled nursing time per patient per day.

Since group I and group II homes provided an almost equal amount of skilled nursing time per patient per day, and since group III homes provided approximately the same amount of time as group IV homes, it would appear that there are two types of nursing homes in Washington, one type, made up of the group I and group II homes, providing skilled nursing care on a 24-hour basis, and the other type, made up of the group III and group IV homes, providing limited skilled nursing services and supervision. The data also suggest that the group I patient is similar to the group II patient and has almost the same nursing needs, and that the group III patient is similar to the group IV patient.

Staffing Guides

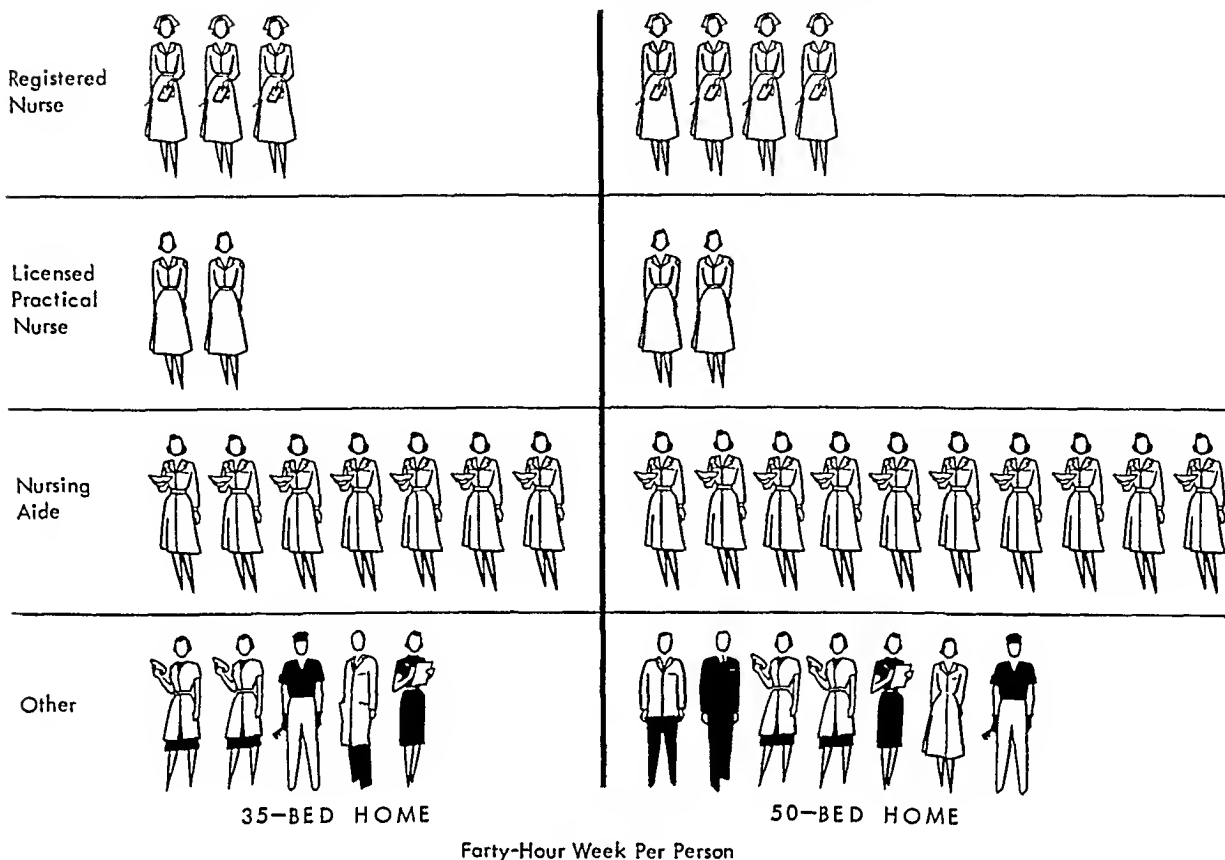
From the data reported in this study, it has been possible to develop staffing guides for "intensive care" homes (groups I and II) and for "limited care" homes (groups III and IV). For example, the study indicated that in group I homes with 31-40 beds there was an average of 115 hours of registered nurse time per week, 86 hours of licensed practical nurse time, 269 hours of nurse aide and orderly time, and 202 hours for other staff (table 5). To determine the number of full-time personnel on duty during a 7-day week, these data were

Table 9. Average number of minutes of nursing time per patient per day, according to type of nursing home, Washington, May 1956

| Type of home | Total nursing | RN | LPN | Nurse aides and orderlies |
|----------------|---------------|----|-----|---------------------------|
| Group I..... | 113 | 28 | 16 | 69 |
| Group II..... | 102 | 20 | 23 | 59 |
| Group III..... | 79 | 27 | | 52 |
| Group IV..... | 42 | 24 | | 18 |

RN=registered nurse; LPN=licensed practical nurse.

Figure 2. Staffing guide for "intensive care" nursing homes.



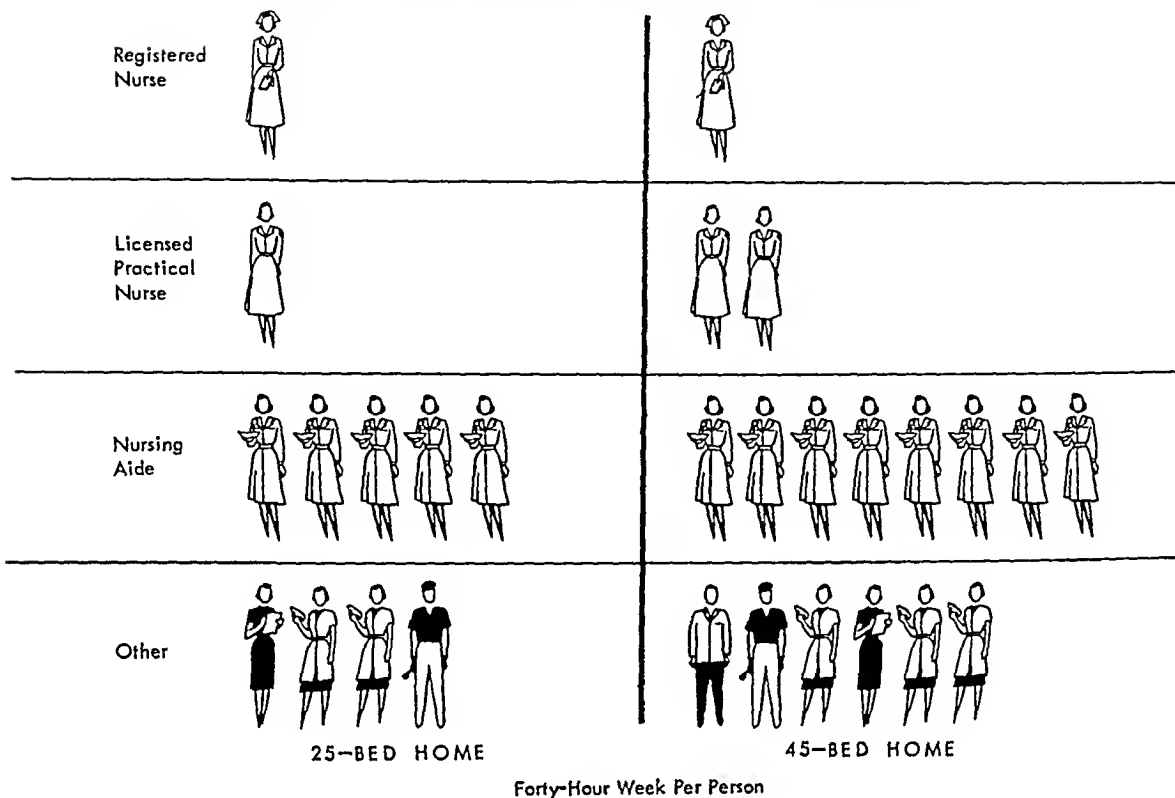
divided by 40 (for a 40-hour work week). The results for this size group I homes indicated averages of 2.8 registered nurses, 2.1 licensed practical nurses, 6.7 nurse aides and orderlies, and 5 other employees. These averages were further analyzed in terms of the work shifts to be covered during the 7-day week and other factors. The numbers were then rounded to full-time equivalents to give the suggested number of employees in the staffing guides.

Guides were developed for a 35-bed and a 50-bed "intensive care" home (fig. 2) and for a 25-bed and a 45-bed "limited care" home (fig. 3). They provide for hours of time slightly above the averages reported in May 1956. This appears to be a realistic minimum since many homes already employ more staff than suggested. It should be recognized that the number and kind of staff needed in any particular home will vary in accordance with many factors. Some of the factors that need to be considered in evaluating the adequacy of

the staff are the type of patients and their need for skilled and other nursing care, the kind of facilities and equipment available, the abilities of each member of the staff, and the philosophy of the operator or management. Also to be considered are the type of medical and other rehabilitative services available, the social and recreational activities provided, and the number of volunteers used. The guides should be useful in working with new or potential nursing home operators, in evaluating staff in existing homes, and in working with other agencies.

For a 35-bed intensive care home the staffing guide provides for a registered nurse on the day and evening shifts and a licensed practical nurse on the night shift for each day of the week. It allows for 2 aides on the day shift, 1 aide on the evening shift, and 1 aide on the night shift. It also recommends an additional aide to cover the time when the workload is greatest. For homes smaller than 35 beds, aide time would be less, with the skilled staff per-

Figure 3. Staffing guide for "limited care" nursing homes.



haps performing nurse aide functions. The amount of skilled nursing time recommended is considered minimum because of the type of patient in intensive care homes.

For a 50-bed intensive care home the guide suggests that a registered nurse be on duty at all times and that, in addition, a licensed practical nurse be employed for the day shift. There would be 4 aides on the day shift, 2 aides on the evening shift, and 1 aide on the night shift. For homes larger than 50 beds additional personnel of all types probably would have to be added, and the staff organized into two or more nursing units.

For a 25-bed limited care home there would be a registered nurse on the day shift 5 days a week and a licensed practical nurse on the day shift 2 days a week and on the afternoon shift 3 days a week. The guide also allows for an aide for each shift. In a 45-bed limited care home an additional licensed practical nurse is suggested to provide for licensed practical nurse supervision on the evening shift and for relief of the registered nurse. There would be 3 aides

on the day shift, 2 aides on the afternoon shift, and 1 aide at night.

Summary and Conclusions

In the State of Washington, nursing homes have been classified into four groups, the classification depending upon the qualifications and number of nursing personnel. In a study in 1956, personnel time was analyzed as to type of service and number of hours and then related to size of the homes and number of patients.

The amount of nursing time available to patients in group I homes averaged about 13 hours but varied from 2 to more than 26 hours per patient per week (7 days). One-third of these homes provided 12.0-13.9 hours of nursing time per patient per week. Nursing time per patient per day in group I homes averaged 113 minutes, 44 minutes of which was skilled nursing time.

Group II homes averaged 12 hours of nursing time per patient per week, with a range of from 6.0 to 23.9 hours. There was an average of 102

minutes of nursing time per patient per day, 43 minutes of which was skilled nursing time.

More than two-fifths of the group III homes reported 8.0 to 9.9 hours per patient per week, with an average of slightly more than 9 hours. The average number of minutes of nursing time per patient per day was 79, 27 minutes of which was skilled nursing time. Group IV homes had a maximum of 9.9 hours per patient per week and an average of 42 minutes per patient per day. Skilled nursing time in these homes averaged 24 minutes per patient per day.

Thus, group I and group II homes are quite similar in total nursing time and in skilled nursing time. There is considerable difference, however, between these two groups and groups III and IV. These two facts suggest the recommendation that there be only two types of nursing homes: intensive care homes, which provide skilled nursing care 24 hours a day, and limited care homes, in which a registered nurse or a licensed practical nurse is in charge of nursing service but not necessarily on duty at all times.

This study has demonstrated that specific requirements for skilled nursing staff influence the staffing patterns, particularly in small homes. In spite of the shortage of nurses, 24-hour skilled nursing supervision in "intensive care" homes has been required in Washington since the licensing program began in 1951. In "limited care" homes, one full-time skilled nurse in charge of the nursing service has been required. Almost all homes meet these standards, and many large ones exceed them. It is recognized, of course, that an official standard or requirement alone does not bring nurses into employment. Pleasant working conditions, intelligent personnel policies, adequate salaries,

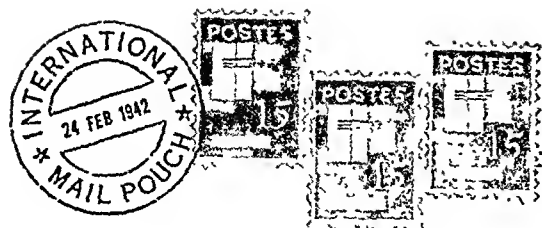
and convenient location and hours have all contributed. The present standards for skilled nursing staff appear to be realistic, and it would seem that they could be increased if indicated. Staffing guides based on data presented in the study have been developed for the recommended types of nursing homes.

The data obtained in this study raise a number of questions that will require collection of additional information. Before requirements for skilled nursing staff are changed, it is essential to learn more about the needs of patients cared for in nursing homes. Such data should be related to the information reported here and also to the specific functions of various personnel, the design of the home, and the equipment available.

This study points up one of the values of good working relationships among local health departments, welfare departments, State and local nursing home associations and nursing home operators. A cooperative effort is necessary to obtain data that can be used in planning and operating programs to improve patient care in nursing homes.

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Life Without Dobbin

A group of farmers in Voinjama, northwest Liberia, live without any domestic animals except chickens. Trypanosomiasis, or sleeping sickness, has ravaged the region for centuries, leaving only chickens and a few goats as survivors. There are no jungle ungulates; in fact, it is said that in all of Liberia there are only two horses. Although the people have adjusted, the human economy is chronically handicapped by the lack of domestic animals.

—EUGENE P. CAMPBELL, M.D., *chief, Public Health Division, International Cooperation Administration.*

Doctor's Holiday

On a busman's holiday, Dr. Arno E. Town culminated his visit to Ganta, Liberia, by treating Liberian patients. Despite advance notice of his visit, a frantic chase at the last minute was necessary to collect 10 patients for him to examine. Most were beyond help but he operated on one patient for cataract. Among the local tribes many more people were treated and given instruction. The noted Philadelphia ophthalmologist was in Liberia as a guest speaker of the Northern Liberia Medical Association.

—JOHN S. MOOREHEAD, M.D., *formerly chief public health officer. U. S. Operations Mission, Liberia.*

A Well for Ricaurte

When the rural environmental sanitation program was extended to Ricaurte, Ecuador, 15,000 people attended five health film showings and villagers donated their labor to excavate a well. Interested citizens formed a large subcommittee on health. The zone health department cooperated by supplying the

services of a medical officer, sanitary inspector, and microscopist.

Ricaurte is the site of the first activities of the sanitation program in Azuay-Canar, a village near Cuenca. Health and education servicios are carrying out a community-school improvement program in the village.

—JAMES D. CALDWELL, *chief, health, welfare and housing field party, U. S. Operations Mission, Ecuador.*

Malariologist's Reward

Children in the malaria-ridden villages near Chiangmai, Thailand, were so used to having malaria all the time they didn't even know they were ill, *but their blood was pale and their spirits depressed.* I watched school children suffering from enlarged spleens and high temperatures trying to study and play.

In the same area 3 years after the malaria control program began, smiling children, literally blooming with health and energy, lined up for examination. As they marched toward us, my colleagues and I cheered spontaneously, anticipating triumphant findings.

Our cheering was justified! Not one of the children was infected although they lived in the heart of a previously malarious district.

—MELVIN E. GRIFFITH, M.D., *chief malariologist, U. S. Operations Mission, Thailand.*

"Kan Ho Won" Replaces "Kan Ho Bu"

"Kan ho won" will replace "Kan ho bu" if Korean nurses have their way. The term correctly used for "nurse" is "kan ho won" which means "a person who has been trained to give care and protection." At their annual meeting in Seoul the Korean Nurses Association drafted a letter requesting government authorities to use "kan ho won" rather than the old Japanese-imposed term, "kan ho bu," a woman who gives care and protection.

A "kan ho won" for 37 years, Mrs. Hyo Chung Lee, chief nurse at the Masan Tuberculosis Sanitarium, was the first Korean to receive the Florence Nightingale Medal.

—ALBERT P. KNIGHT, M.D., *chief, Health Division, U. S. Operations Mission, Korea.*

Continuity of Patient Care

CONFERENCE REPORT

MORE effective means of transmitting information between hospitals and public health nursing services in order to provide continuous care for patients was the subject of a conference held in Chicago on May 11 and 12, 1956, under the sponsorship of the departments of hospital nursing and public health nursing of the National League for Nursing.

The main aim of the conference was to encourage planned nursing services in hospitals and in agencies providing home care, although community planning was also emphasized.

Basic to all other considerations is the mechanism by which information relating to the patient's physical, psychical, and social circumstances may be transmitted as the patient moves between hospital, clinic, and home. The conferees agreed that one person, acting as coordinator and administrator, in each institution must be responsible for the effective administration of the program. All reports concerning the patient should be written, with "feedbacks," or written responses to reports, a necessary part of a fluid communication system. Conferences were recommended for the workers when the patient is admitted and discharged.

The chief concern of community planning would be to promote understanding by means of conferences, articles, and cooperation among various groups sharing the same interests. With an efficient planning committee, community needs could be ascertained in terms of the extent of service to be provided for the patient. The committee could also determine, if necessary, priority cases. In addition, the commit-

tee should establish a standard referral form, acceptable to all participants, for transmitting information.

Backgrounds for discussion were supplied by Dr. George A. Silver, chief of the division of social medicine, Montefiore Hospital, New York City; Doris Schwartz, instructor in outpatient nursing, Cornell University-New York Hospital School of Nursing; and Dr. Bess Sondel, professorial lecturer in communication, University of Chicago.

Silver, believing that "good patient care calls for attention to physical, emotional, and social factors, for consideration of what will happen after the patient leaves the hospital, for example, and of what happens before the patient comes to the hospital," stressed the need for nurses to play more extensive roles in patient care. Before they can, however, two ideas must be generally accepted, Silver pointed out. First, the nurse "needs to be involved in planning, consulted on progress, and advised of developments." Second, "the nursing part needs to be admitted into rational organization of medical care."

Given a greater role to play, the public health nurse can provide information about the patient and his family which would be welcome to the hospital nurse, while the latter, with her special knowledge of the patient's attitude toward his illness, himself, and his family, could facilitate aftercare and rehabilitation by transmitting her information to the public health nurse.

The patients who Silver feels to be most in

need of continuous care are new mothers and infants, the tuberculous, cardiacs, hemiplegics, and diabetics, those subjected to radical or mutilating surgery, the aged, the mentally ill, and children suffering from long-term illnesses.

The nursing service, he asserted, "must now organize its services to the sick so as to include a continuity of concern in and out of the hospital." He emphasized the need for a discharge planning conference to establish a bridge between private and public nursing services. The discharge planning conference would enable the doctor, nurse, social worker, nutritionist, and physical and occupational therapist to describe the obstacles and adjuvants to continuing patient care in the home. Furthermore, information coming back, after a patient has been at home for a time, will provide additional educational material for all those participating in the conference. It is important to the field nurse's morale, Silver added, that her reports be read and answered.

Miss Schwartz gave a brief history of a referral system begun in 1939 between the Henry Street Visiting Nurse Service and the New York Hospital, and expanded through the years until, in 1946, the Greater New York Interagency Referral System was established.

The objective of a good referral system, Schwartz declared, is to provide continuous nursing care. Such a referral system implies well-established communication lines, planned conferences, visits to patients' homes before discharge, and the establishment of a close relationship among those professionally involved.

In order to make a referral system work, continuous nursing care must be seen as a legitimate nursing function, and as the kind of care that can be provided by good liaison between the hospital and the community nursing agencies. And it should be adopted as a goal that "no patient who would benefit by public health nurs-

ing referral, following a hospital or clinic experience, should go unnursed or poorly nursed through the failure of nurses to consider the appropriateness of such a referral."

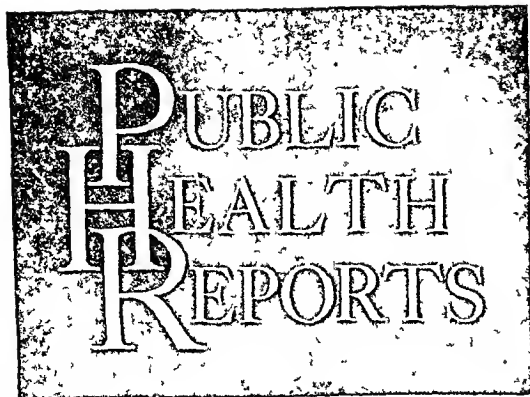
If the patient's problems are kept central, Schwartz believes, any antagonisms which may arise among the groups can be overcome.

Samples of interagency referrals were provided. These referrals include reports by the physician, hospital nurse, physical and occupational therapists, dietitian, medical social worker, and public health nurse.

Sondel described the exercise of feedback as a means of improving communication. Unless a communicator is able to learn how her information is received and interpreted, she is unable to judge whether or not she is being understood, and whether her purpose in giving information is being carried out. Through feedbacks from those who have used the information, a nurse learns to see her work in relation to that of others, gains greater understanding of the importance of sharing information, and learns how to make her reports more helpful to others. It is important, therefore, that a means of reporting back on information received be provided.

Sondel discussed the effect of nonverbal communication, the flexibility needed to acquire deeper understanding of what is communicated to an observer, and the stability in discourse which is obtained from a critical examination of the patterns words make, with reliance upon one's own examined pattern.

A summary of the conference, including verbatim accounts of the addresses, is available to the public. Published as "Hospitals and Public Health Nursing Services Plan Better Care," it can be purchased for \$1.00 from the Department of Public Health Nursing, National League for Nursing, 2 Park Avenue, New York 16, N. Y.



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frontispiece

Spread and pattern of Asian influenza epidemics, through October 7, 1957.

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

MARION B. FOLSOM, *Secretary*

PUBLIC HEALTH SERVICE

LEROY E. BURNEY, *Surgeon General*

ASIAN **VARIANT**

INFLUENZA **TYPE A**

In the fall of 1957 the United States experienced the most extensive influenza epidemic in 40 years. This, in itself, is a historical event of major medical and public health significance. Equally significant is the fact that for the first time in our history the Nation was making real preparations for an epidemic before it appeared.

Although morbidity and mortality rates, as was predicted, did not equal those of the 1918 pandemic, we shall never know, precisely, the total who were incapacitated or the real impact on the national economy. That it was substantial is indicated by the samplings taken by the U. S. National Health Survey, which showed that more than 80 million Americans suffered from illness of the upper respiratory tract between July 1 and December 1, 1957,

of such severity that they had to spend one or more days in bed. While all of these cases were obviously not Asian influenza, it is reasonable to assume that the illness accounted for the majority.

At the time at which this is written—in late December—it would appear that the epidemic has pretty well run its course in the United States. Opinion differs on the possibility that by the time this appears we may be experiencing a second wave; and a substantial amount of Asian influenza is anticipated during the midwinter months.

The fairly rapid decline in new cases during late November indicated that the first wave was over; and that the time was appropriate for a provisional summing up of our national experience with this epidemic.

Historical perspective will provide more definitive conclusions than are reached in the following pages. The story as it is here recorded, however, will be of interest to the public health profession and may well suggest guidelines for meeting similar health problems in the future.

To me, one of the most significant things about our national experience has been the demonstration of how quickly and effectively our national medical and health resources can mobilize to combat the threat of nationwide illness. The keynote of the whole program, in fact, has been the cooperation of the many toward a single goal. I do not know of another instance in our peacetime history in which so many of the elements of our society, in so short a time, have joined together to identify a health problem, determine the means for its solution, and to work toward resolving it.

These elements have included the agencies of the Federal, State, and local governments, notably, the Department of the Army, which first isolated and identified the Asian influenza virus, the medical and public health profession, professional societies, the voluntary health agencies, the pharmaceutical manufac-

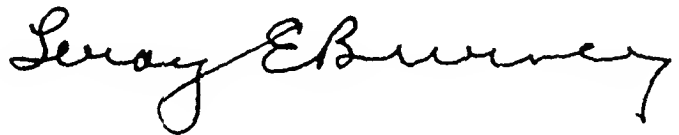
turners, advertising, and, in full measure, the press, television, and other media of professional and public information and education.

Throughout this report, the contributions of these groups and others are noted. It is not inappropriate to extend to all of them and to the hundreds of individuals who have worked on the problem, a word of appreciation on behalf of their fellow Americans.

I mentioned earlier the statistics of incidence. Certainly it was substantial. The rapid production and distribution of the vaccine during the fall months, however, unquestionably reduced the impact of the epidemic. Many millions of persons, we can be certain, did not contract Asian influenza because of the protection of the vaccine.

This issue of *Public Health Reports* includes a report on the Asian influenza epidemic and the steps taken to study and control it. The report suggests, among other things, that the profession and structure of public health are stronger as a result of our experience with the Asian influenza epidemic of 1957.

More important, it provides a document which, under study, may yield knowledge on how we can do a better future job for the people of the Nation in whose cause we serve.





Administrative History

of

THE ASIAN INFLUENZA PROGRAM

WILLIAM H. STEWART, M.D.

THE ASIAN INFLUENZA program of the Public Health Service, at this writing, would appear to fall, chronologically and functionally, into four phases. The first, a period when information was received and policy issues were broadly delineated, began in the spring of 1957 and ended with the first meeting of the Surgeon General's Advisory Committee on Influenza on June 10.

As the disease occurred sporadically in the United States during the summer, the Public Health Service deployed its resources to maintain surveillance, conferred with manufacturers on problems of vaccine production, determined the requirements of alternative courses of action, and secured the cooperation and financial support necessary to institute the program finally adopted. This developmental phase, as it may be characterized, came to an end late in August.

Dr. Stewart, Assistant to the Surgeon General, has served as liaison for the influenza activities of the Office of the Surgeon General, Public Health Service.

On August 27-28, 1957, the State and Territorial health officials met in Washington at the request of the Surgeon General. The virus was then widely seeded across the Nation, the licensed influenza vaccine manufacturers were in full-scale production, and the medical, hospital, and public health authorities of the Nation, through their professional organizations, had made plans to mobilize their resources in the event of a large-scale epidemic. After reviewing this progress, the health officers concurred in the decisions taken and called for further specific action by the States and the Public Health Service.

We are currently in the operating phase of the Asian influenza program, a phase perhaps drawing to a close. At some time in the spring of 1958, a year more or less after Asian influenza was first reported, the retrospective evaluations will begin. This fourth and final phase may well be lengthy, for the Asian influenza episode is unique in the history of public health and deserves the thoughtful consideration it is certain to receive from students of

medicine, epidemiology, virology, immunology, public health administration, and health education.

This chronicle records administrative aspects of the Asian influenza program of the Public Health Service, from the viewpoint of the Office of the Surgeon General. It will deal only with the first two periods categorized above, the administrative problems of the latter two phases being relatively commonplace. Administrative issues presented in the early months of the program, however, were unprecedented and therefore require elucidation.

Nation Alerted

As is well known, the initial laboratory work on the Asian influenza virus was performed, with exemplary initiative and speed, by the Army: the 406th Medical General Laboratory in Japan and the Walter Reed Army Institute of Research in Washington, D. C. The results of this work were communicated at once by the Army virologists to their counterparts in the Public Health Service, with whom they are in continuing close professional contact. The situation first came to the attention of the Office of the Surgeon General on May 20, 1957, when the director and an associate director of the National Institutes of Health reported orally to the Acting Surgeon General that epidemic influenza with unusually high attack rates was being reliably reported from Asia.

The Deputy Surgeon General, who was at this time acting head of the Public Health Service because the Surgeon General was in Geneva at a World Health Organization meeting, designated the associate director of the National Institutes of Health, a virologist, as technical point of contact for the Surgeon General with respect to the developing influenza situation. The Acting Surgeon General next informed the Assistant to the Surgeon General for Information and designated a medical officer to maintain special liaison with the Institutes.

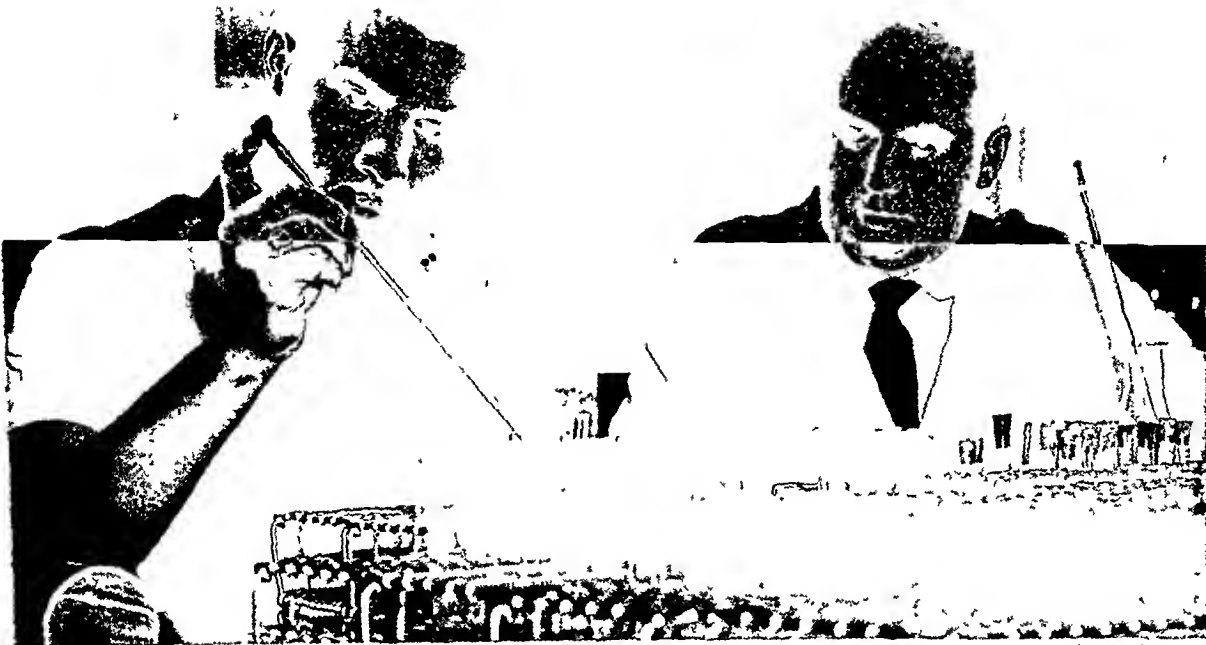
On May 22, the National Office of Vital Statistics submitted a memorandum summarizing reports of the spread of the disease. During that first momentous week, the staff of the

Special Assistant for Health and Medical Affairs to the Secretary was being kept apprised of the situation. From the National Institutes of Health came a report of a "dry run" exercise in vaccine production conducted by the manufacturers with the "London" strain in 1951, as well as a memorandum from the director of the Division of Biologics Standards outlining the technical steps that must precede mass immunization with a new vaccine. More specific information with respect to potential vaccine production was requested from the National Institutes of Health.

When the bureau chiefs met for their regular staff meeting with the Office of the Surgeon General on May 28, the Army had supplied Asian strains of the influenza virus that were not compatible with previously known strains. The National Institutes of Health had made the new strains available to licensed vaccine manufacturers, in accordance with established procedure, so that they could prepare to incorporate them in the polyvalent influenza vaccine then being produced, if this were deemed desirable.

The Acting Surgeon General recalled that when the Armed Forces began routine annual influenza immunization in 1954, the Public Health Service did not recommend comparable immunization of the general public. This decision was rooted in the relatively short duration of demonstrated immunity and lack of assurance that strains in the polyvalent vaccine would be the ones responsible for future epidemics. However, the Acting Surgeon General now believed it necessary to reexamine, in the light of later developments, the bases of Public Health Service policy on immunization of civilians against influenza. The Bureau of State Services and the National Institutes of Health were therefore asked to confer and to forward an analysis and recommendations.

Formal Public Health Service participation in the national common effort began on May 28 at a conference called at the requests of the chiefs of preventive medicine of the three military services to consider the control of influenza caused by the new strain of virus which had been first reported from Hong Kong on April 17. The Public Health Service was rep-



Walter Reed Army Medical Center

At the Walter Reed Army Institute of Research, Dr. Maurice R. Hilleman (right), who first identified the Asian influenza virus as a new strain of type A, observes as Pfc. Virgil Ewing tests the immunological response of the new vaccine developed against the virus.

resented by an associate director of the National Institutes of Health and the director of its Division of Biologics Standards.

The conference was informed that the disease was clinically mild with high attack rates on naval vessels and among civilians. Laboratory evidence indicated that the virus responsible was, for practical purposes, antigenically new; antibodies to it were absent in both animals and humans who had been highly immunized naturally or artificially against preceding strains of influenza virus. The virus had already reached the United States, in the opinion of the group, but the disease was not expected to reach major epidemic proportions until fall.

The conference recommended to the military Surgeons General that the Department of Defense procure about 3 million cubic centimeters of a monovalent vaccine containing the Hong Kong strain of the virus, the desired strength of this vaccine being tentatively set

at 500 CCA units. September 1 was the target date recommended for the start of the vaccination program for military personnel. The Commission on Influenza of the Armed Forces Epidemiological Board was requested to propose as quickly as possible the composition of a polyvalent influenza virus vaccine to be used later in the year.

On May 29, the associate director of the National Institute of Allergy and Infectious Diseases forwarded a memorandum describing the Influenza Study Program of the World Health Organization and mentioning the probable need for an increase in the number of collaborating laboratories in the United States and for providing them with diagnostic reagents for detection of the Asian influenza virus. The director of the National Institutes of Health also submitted a memorandum, after consultation with the chief of the Communicable Disease Center, recommending that the monovalent vaccine desired by the Defense Depart-

ment be licensed; that the Communicable Disease Center furnish typing antisera to State laboratories; that State epidemiologists be advised to watch for outbreaks of Asian influenza; that the Epidemic Intelligence Service of the Communicable Disease Center promptly investigate reported outbreaks; and that "the role of influenza vaccine as a public health measure be carefully studied"

The chief of the Division of Foreign Quarantine also forwarded a memorandum to the Office of the Surgeon General on May 29. It advised that quarantine officers at Honolulu, Seattle, San Francisco, and Los Angeles were inspecting inbound traffic for influenza signs and symptoms and notifying health officials of their occurrence. Passengers were being asked their itineraries for 2 weeks before and after quarantine inspection, with notification of local and State health departments following when indicated.

After reviewing these documents, the Acting Surgeon General met with the Assistant to the Surgeon General charged with special influenza responsibilities and the deputy chief of Information Services. It was decided to call the Bureau of State Services and the National Institutes of Health representatives together for more collaborative analyses and recommendations than had yet been presented. The information function was represented at this stage because of the public's obvious "need to know" about the nascent influenza policies.

Two days later, on May 31, the Acting Surgeon General wrote: "Nothing about influenza is more certain than that new strains appear, presumably by mutation, and epidemiologists have postulated that the 1918 pandemic was the result of such a mutation and that another pandemic may arise at any time from the same phenomenon. The question then is simply whether the current situation is sufficiently unusual to indicate the possibility that this has occurred. This decision requires careful consideration by the epidemiologists. If it [the current situation] is unusual or almost unique, the burden of proof would seem to be on those who oppose the recommendation to press for a mass immunization against the new strain with all possible vigor." The Acting Surgeon General then requested the principal staff officers to consider

whether "the investment of the few million dollars necessary to develop and disseminate vaccine as widely as possible would be a logical step to recommend . . . if the current influenza situation was indeed unusual . . . [with] even a possibility of a widespread epidemic next fall."

Broad Planning

On the afternoon of May 31, officials of each bureau met with an Assistant to the Surgeon General to plan Public Health Service action with respect to Asian influenza. The conferees discussed coordination of Public Health Service activities, improvement of arrangements for influenza reporting, and influenza vaccine as a public health measure. The problems of producing a monovalent vaccine were compared with those of producing a polyvalent vaccine containing the new strain. The lack of comprehensive data dealing with effectiveness of influenza vaccines among the civilian population was noted.

The Division of Foreign Quarantine was asked to work closely with the Epidemic Intelligence Service of the Communicable Disease Center and to report all relevant information promptly to the National Office of Vital Statistics. The Communicable Disease Center was asked to alert State health departments and laboratories, intensify its influenza surveillance, and report its findings to the National Office of Vital Statistics, from whence information would be disseminated biweekly to all concerned in the Service and elsewhere. Announcement of the steps that were being taken would be released to the press on June 3 and an article alerting physicians prepared at once for the *Journal of the American Medical Association*. Meanwhile, the National Institutes of Health would continue work on problems of vaccine production. It was agreed that more time was needed to observe the course of the epidemic and progress in producing vaccine before it would be possible to give a mature judgment on the question of influenza immunization for the general public.

On June 5 the Division of Foreign Quarantine reported influenza aboard a civilian ship bound for San Francisco from the Orient. The Office of the Surgeon General was also advised

that inquiries had already been received from other Federal agencies and transportation lines concerning Service policy on use of the polyvalent influenza vaccine then available in small quantities through commercial channels.

Questions of this nature were discussed that day at a meeting called by the Assistant to the Surgeon General designated to deal with Asian influenza. Representatives of all bureaus were present. The associate director of the Institutes stated that the odds favored a mild epidemic in the fall or winter, but that there was some possibility of an epidemic on the order of the 1918 experience. The technical problem of vaccine production had been solved, he reported; a monovalent vaccine could be expected in September and a polyvalent vaccine incorporating an Asian strain a month later. Monovalent vaccine production had been started with purchases by the Department of Defense.

He suggested that certain groups, such as transportation, communications and utility workers, hospital personnel, and some Federal employees, receive the monovalent vaccine as soon as the Armed Forces. (A list of proposed civilian occupational priorities for vaccination against influenza had been prepared as part of the 1951 exercise.) These actions would not require additional funds. The deputy chief of the Bureau of State Services proposed that the Surgeon General seek the counsel of an advisory group representative of public health officials, practicing physicians, and the vaccine manufacturers. He foresaw advocacy by the Public Health Service of large-scale immunization, under certain conditions, and this would require additional expenditures.

The members of this meeting thereupon recommended that the Surgeon General confer with a representative professional group to ascertain its reaction to proposed recommendations by the Service that influenza vaccine be used generally in the civilian population and that certain special groups receive the monovalent vaccine as soon as it became available. No additional funds were believed necessary for these influenza activities. The advisers were to be told, however, that if the virulence of the virus increased or if the influenza case fatality rate turned upward, the Service would attempt to accomplish vaccination of all civilians. Au-

thority to divert funds would be requested in this unlikely event, and supplemental funds would be requested to replace any so diverted.

There was, of course, considerable correspondence and informal liaison with congressional committee staffs and with offices of individual Senators and Representatives throughout the period described in this report. In reply to many inquiries, on June 7, after his return to the United States, the Surgeon General wrote to the chairmen of the committees and subcommittees of the House of Representatives and the Senate which are responsible for substantive and appropriations legislation for the Public Health Service. He advised them of the developing situation and furnished a summary of events and actions taken, including an announcement of a meeting on June 10 of a special advisory committee of physicians and health officers.

The Advisory Committee on Influenza, which first met on June 10, included the secretary of the Executive Committee and the chairman of the Civil Defense Committee of the Association of State and Territorial Health Officers; the president of the Academy of General Practice and a member of the board of trustees of the American Medical Association; representatives of the American Public Health Association and the American Academy of Pediatrics; the director of the Commission on Influenza, Armed Forces Epidemiological Board, and a spokesman for the Division of Preventive Medicine, Office of the Surgeon General of the Army; and the Special Assistant for Health and Medical Affairs, Office of the Secretary of Health, Education, and Welfare. Officials of the Service with influenza responsibilities also attended, as well as a representative of the Children's Bureau.

General findings of the meeting were:

1. No major outbreaks were expected to occur before fall, although sporadic occurrence could be expected throughout the summer.
2. Since limited information suggested that the existing polyvalent vaccine was not effective against the new influenza virus strain, an effective monovalent vaccine should be produced as soon as possible.
3. Every effort should be made to test vaccines and to collect, study, and disseminate

information on the epidemiology of Asian influenza. Consideration should be given, but based on later and more complete information, to the use of a vaccine by the civilian population.

4. No change should be recommended in private physicians' practice in utilizing the existing polyvalent vaccine. Physicians should immediately report suspicious cases to their health departments so that any occurrence of suspected influenza could be investigated quickly.

5. The situation did not yet appear to justify establishment of priorities for civilian use of the vaccine or consideration of government subsidy in its production.

The gist of these findings was telephoned on June 10 to the regional medical directors, who were directed to telephone the same information to the chief State health officials in their region. The Surgeon General had directed that the States be kept fully informed with all possible speed. To this end, among other measures, the chief of the Bureau of State Services frequently telegraphed State health officials during the summer to alert them to influenza information in the *Morbidity and Mortality Weekly Report* and to report other developments.

After the meeting of the Advisory Committee on Influenza, the Surgeon General held a general press conference. (He and other members of his staff were accessible to individual reporters throughout the period described.) Interest of the press and public in influenza rose sharply as a result. The voluntary health organizations were immediately alert to the various eventualities inherent in the situation. On June 11, the managing director of the National Tuberculosis Association, for example, generously offered the cooperation of the association and its affiliates for the health education of the public, if this should become necessary. Similar messages were received from other large voluntary health and welfare associations and professional societies.

Tempo Intensified

The June 10 meeting, as has been noted, marked the end of the first phase of the Asian influenza activities of the Public Health Serv-

ice. After that meeting, the tempo of those activities increased markedly, as outbreaks of the disease increased across the Nation and as the time approached for decision on the major policy issues. As recognized on June 10, these were:

1. Whether to recommend vaccination and of what segments of the population.

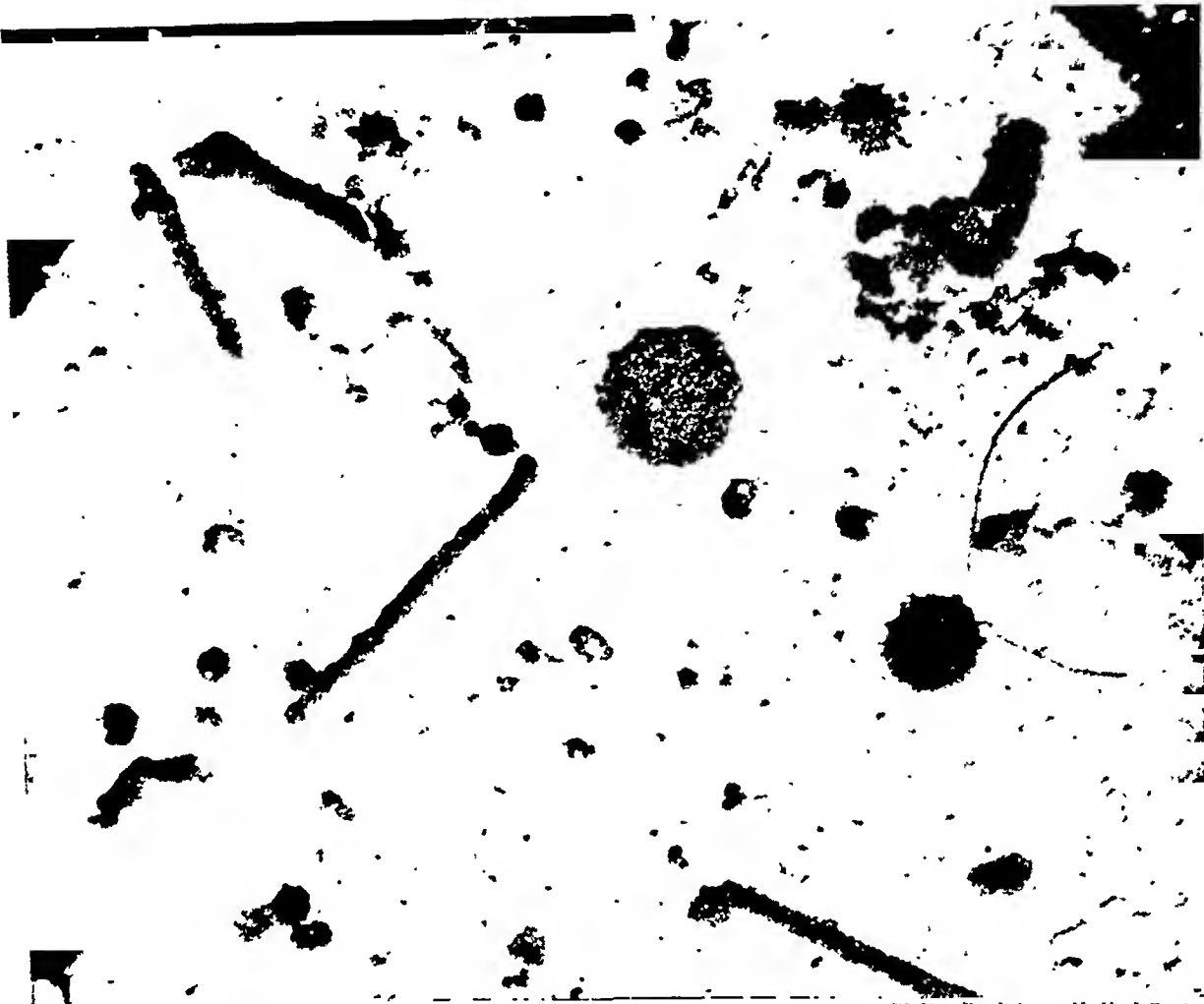
2. Whether to rely on a monovalent or polyvalent vaccine, a complex question related to factors of effectiveness and supply.

3. The extent of further Public Health Service participation in influenza programs.

The second or developmental phase of Public Health Service Asian influenza activities opened with a meeting on June 12 of technical representatives of the vaccine manufacturers with the National Institutes of Health. The latest epidemiological information was presented to the manufacturers, with data on the influenza virus strains encountered and their growth characteristics. Each firm summarized its experience with the growth of the various strains used in the production of influenza vaccine.

The proposed strain constitution of vaccines for military and civilian use was then discussed. The proposed formulas for military monovalent and polyvalent vaccine caused no comment, but some discussion concerned the proposed polyvalent vaccine for civilian use. The manufacturers expressed a preference for a monovalent vaccine containing the Asian strain. There was general agreement that the low antigen yield of the Asian strain as measured in CCA units made it difficult to obtain material of sufficient concentration for inclusion in the proposed polyvalent vaccine. It was pointed out that much of the vaccine prepared for the coming influenza season had already been pooled, and the Asian strain could not be added because it could not be produced in high concentration. In view of this difficulty, each manufacturer agreed to review its inventory and submit as quickly as possible an evaluation of the formula that would make best use of the material at hand.

By June 17 the special weekly influenza report to the Surgeon General brought word of potency studies of monovalent vaccines conducted by the Virus and Rickettsia Section,



Walter Reed Army Medical Center

Electron microscope photograph of Asian influenza virus.

Communicable Disease Center, Montgomery, Ala. Such studies are essential for standardization of vaccines. The reactivation of the Inter-Service Influenza Advisory Committee, which had been recommended at the June 10 meeting, was also reported. The Armed Forces Epidemiological Board, the National Institutes of Health, and the Communicable Disease Center each planned to have an epidemic intelligence team ready on short notice to investigate influenza outbreaks anywhere in the world. The Division of International Health of the Public Health Service and the Regional Office of the World Health Organization made arrangements to facilitate the rapid departure of these standby teams. It will be recalled that at that time no isolation of the Asian strain

had yet been made in the United States. It was therefore important to learn as much as possible from epidemics abroad, looking especially for evidence of increased virulence.

The first report of Asian influenza in the United States came from the Navy by telephone on June 18. Aboard ships at the Naval Station at Newport, R. I., none of which had been in Far Eastern waters, the disease was running a course similar to that reported from the Orient and elsewhere.

Countering All Eventualities

On June 20 an Associate Director of the National Institutes of Health set down the following alternatives for the course of the disease and corresponding action to counter each:

1. *An explosive epidemic before September 1, 1957, with either (a) continued low mortality, or (b) increased virulence.*

Vaccination could not be considered, except for limited supplies of polyvalent vaccine and possible production for use in 1958.

A professional and public information program and mobilization of medical resources, both in cooperation with the American Medical Association, would be imperative.

Expansion of epidemic intelligence and diagnostic laboratory networks would be essential.

2. *Sporadic local occurrence during the summer with an explosive epidemic during the winter, again with*

(a) *continued low mortality.*

Vaccination of priority groups, as many as 6 million people, would be indicated.

A professional and public information program and mobilization of medical resources, both in cooperation with the AMA, would be imperative.

Expansion of epidemic intelligence and diagnostic laboratory networks would be essential.

(b) *increased virulence.*

Maximum vaccine production and immunization would be required, with priority groups vaccinated first.

A professional and public information program and mobilization of medical resources, both in cooperation with the AMA, would be imperative.

Expansion of epidemic intelligence and diagnostic laboratory networks would be essential.

3. *Sporadic local occurrence during the summer with a winter of normal influenza incidence.*

No recommendation of influenza vaccination would be indicated.

Expansion of epidemic intelligence and diagnostic laboratory networks would still be essential.

The appropriate staff members were directed to develop the personnel, financial, and legislative requirements of these alternatives.

The logical possibilities set down in this form represent the alternatives then facing the decision-makers in the Public Health Service and elsewhere. The consensus in the Public Health Service during the middle of June was that the most probable outcome would be sporadic local occurrence during the summer with an epidemic during the fall or winter that would result in a relatively small increase in mortality. A widespread epidemic before Labor Day with low mortality was considered a reasonable possibility, but the odds against this event were believed to be greater than those favoring a benign epidemic later.

The hypothesis that the Nation would experience a winter of normal influenza incidence

was considered wishful thinking. On the other hand, a repetition of the notorious pandemic of 1918 was also considered most unlikely, with probabilities of 1 in 20 to 1 in 40 against such an event. It could not be overlooked, however, that, historically, pandemic influenza of high mortality has recurred at intervals of about 20 years, and there had been no such experience for 39 years.

It was clear at this time that quantities of potent vaccine sufficient for large-scale immunization could not be anticipated until after the middle of August. If an epidemic occurred before Labor Day, with either mild or extreme mortality, there would be virtually no vaccine available. If the epidemic developed during the fall and winter, as seemed most probable, it would be possible to immunize a substantial segment of the population, provided that vaccine production was at a high level during the summer and fall. This would assure continuity of essential civilian services and protect those vaccinated against the discomfort and danger (relatively high for aged persons and those with a history of chronic respiratory or cardiac disease) of an attack of influenza. Production of large quantities of vaccine was also indicated to protect against the possibility of increased virulence of the Asian strain.

The framework of alternatives and the reasoning described above was presented to the Secretary of Health, Education, and Welfare on June 24, with preliminary estimates of probable cost of each possibility and new legislative authority that might be needed. On June 26 the Surgeon General met with representatives of the American Medical Association to describe the progress of the disease toward this country and discuss the question of medical manpower in the event of a serious epidemic. The outlook for immunization against influenza was also discussed, and the alternative types of Federal action envisaged by the Service were described. It was made clear that the situation did not appear to warrant large-scale vaccine purchases or subsidization of production by the Government. Agreement was then reached on the conduct of a joint Public Health Service-American Medical Association cam-

paign of public information and health education. News of Asian influenza was on the front pages and television screens, but the public had not learned what it could do to protect itself. The association was represented at this meeting by two trustees, the chairman of the Committee on Civil Defense and the assistant secretary-general manager.

On the next day the National Institutes of Health reported plans for research on influenza that would take advantage of the unique opportunities expected during the 1957-58 season. These plans included clinical studies of patients experiencing epidemic influenza, with particular emphasis on cardiovascular and systemic manifestations; studies of the factors contributing to elevated influenza mortality among aged or debilitated patients; and studies of the disease among vaccinated civilian communities. Not only was it possible to support these research projects with funds previously made available, but no additional funds were requested by the National Institutes of Health for its influenza vaccine studies, microbiological studies of patients with influenza, or laboratory studies and normal statutory control of vaccine production.

On July 1 the Surgeon General's weekly memorandum to the Secretary's Special Assistant for Health and Medical Affairs reported a number of civilian cases in the United States that were believed to be Asian influenza, although it had not been possible to obtain laboratory confirmation of the tentative diagnoses. Influenza diagnostic reagents had been shipped to all domestic laboratories in the WHO Influenza Program, however, and improvement in the reporting of confirmed cases was expected. Advices from abroad indicated that morbidity and mortality rates were unchanged.

On July 2 officials of the Bureau of State Services and the Bureau of Medical Services discussed the possibility of an influenza outbreak at the International Boy Scout Jamboree to take place at Valley Forge, Pa., July 12-18. More than 50,000 Scouts were expected from all parts of the Nation and abroad. Physical examinations were to be made on arrival, a satisfactory physician-Scout ratio would exist, and as many as 25,000 hospital beds could be fur-

nished in the vicinity by military, private, and Federal Civil Defense Administration hospitals, if an epidemic should develop. In addition to the Public Health Service, military, Scouter, and local civilian physicians, representatives of the State health department, and CDC Epidemic Intelligence Service officers were to be on the scene. These precautions were considered sufficient. During the Jamboree a few hundred Scouts were hospitalized because of upper respiratory infections, but this was not much more than normal incidence, in the opinion of the chief medical officer for the encampment, a physician from the PHS Hospital, Stapleton, N. Y. Confirmed cases of Asian influenza were largely confined to Scouts from California and Louisiana.

On July 3 the director of the National Institute of Allergy and Infectious Diseases was designated the "focal point" at the National Institutes of Health for influenza matters. NIH influenza research and licensing responsibilities involved the National Institute of Allergy and Infectious Diseases, the National Heart Institute, the National Institute of Mental Health, the National Institute of Neurological Diseases and Blindness, the Division of Biologics Standards, the Division of Research Grants, and the Clinical Center.

Confirmed Civilian Cases

Word came from the California State health officer on July 9 that laboratory results indicated Asian influenza as the cause of an outbreak of acute respiratory illness that had affected 200 teen-agers meeting at Davis, Calif., late in June. These were the first confirmed civilian cases of Asian influenza in the United States. Another outbreak then under investigation involved young people from 43 States and 10 other countries who had gathered at Grinnell, Iowa. Asian influenza was later proved in the laboratory to be responsible for this outbreak also, and it was further established that one of the young people at the Davis meeting afterward attended the Grinnell gathering.

An assistant to the Surgeon General met with officials of the American Medical Association in Chicago on July 9 to discuss recommenda-

tious with respect to influenza that were then being drawn up for action by the trustees of the association. The activities discussed at this meeting and later authorized by the trustees included professional information and education through the AMA publications, preparation of public information materials (in cooperation with the Public Health Service) for use when necessary, and standby plans by State and county medical societies to deal with serious epidemics.

On July 9 the Communicable Disease Center issued the first of a series of weekly reports summarizing laboratory information and epidemiological data reported by State health departments, Epidemic Intelligence Service officers, collaborating influenza diagnostic laboratories, and other sources.

On July 10 the Service announced establishment of specifications for manufacture of vaccines containing the Asian strain. On the same day the Executive Committee of the Association of State and Territorial Health Officers met in Washington, D. C., with Service officials. Influenza was discussed at length, with the Service urging more complete reporting from local sources and full utilization of laboratories for definitive diagnosis of the disease. The health officers agreed that the Public Health Service and the American Medical Association should conduct a vigorous campaign of public information and health education urging immunization against influenza. In the past, influenza vaccines had been used, for the most part, by large firms for the protection of their employees. However, the potential dangers accompanying a large-scale epidemic, which now appeared highly probable, made it advisable to stimulate wider use of the only preventive available.

On July 11 the Public Health Service consolidated recommendations from its bureaus and meetings with outside groups and developed proposals for further action against Asian influenza. These were submitted to the Secretary of Health, Education, and Welfare on the following day.

In Geneva on July 11, during the Fourth International Poliomyelitis Congress, the chief of the Endemioepidemic Diseases Section of the World Health Organization called an informal

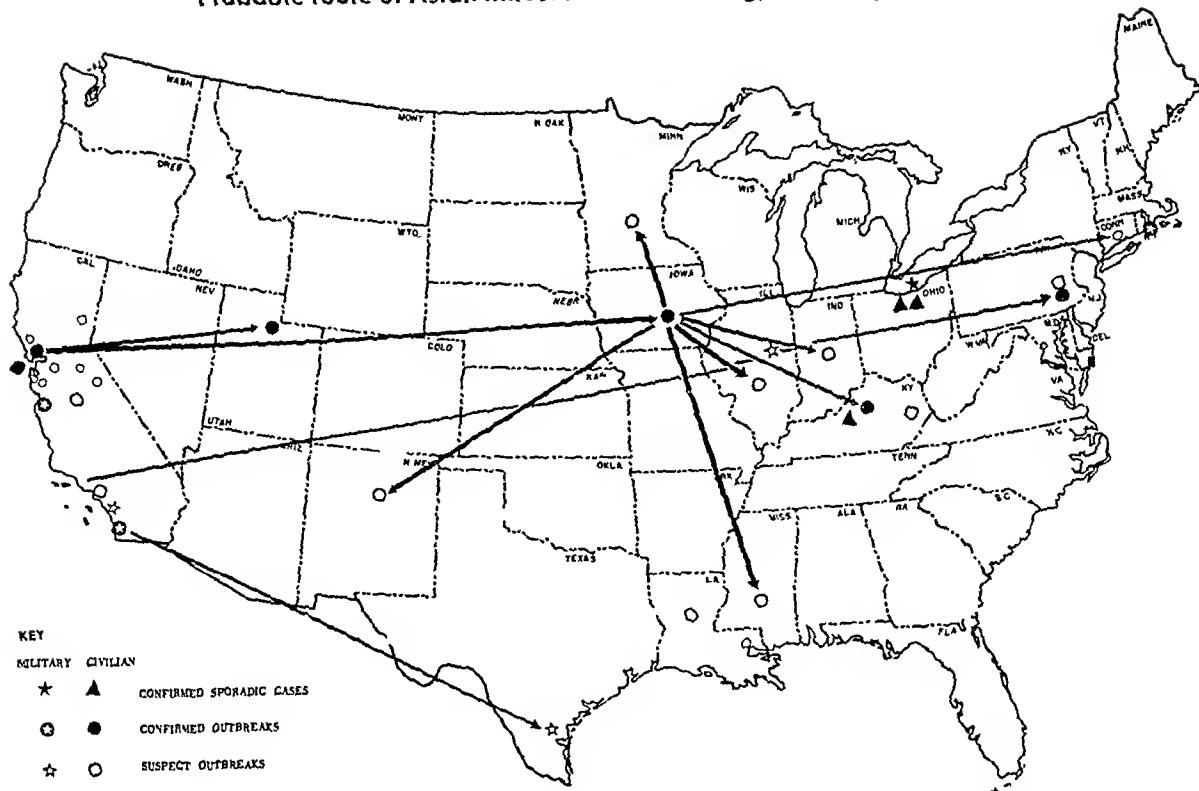
meeting of scientists present in Geneva to discuss the influenza situation. A useful exchange of information ensued. One of the incidental results of this meeting was international agreement that "Asian influenza" was both a descriptive and appropriate appellation for the contemporary manifestation of the ancient disease.

In mid-July two major policy decisions had to be made. Whether to recommend vaccination against influenza for civilians was one. Medically it was indicated, but the large quantities of vaccine that were needed had never been manufactured rapidly. The Surgeon General had decided to rely upon established physician-patient relationships for immunization. Except for protection of its own patients and employees, the Service did not plan purchases of vaccine. In these circumstances, could the manufacturers produce ample influenza vaccine? Would they shoulder the attendant risks?

From July 15 through July 19, the Surgeon General discussed the potential supply of influenza vaccine by telephone with each of the licensed manufacturers in turn. They appreciated the desirability, from the standpoint of public health, of immunizing as much as one-third of our population during the fall and winter. Given the forecasts of the epidemiologists and the plans being developed by the Public Health Service and the American Medical Association to meet an emergency, the manufacturers were willing to invest heavily in the production of influenza vaccine without financial assistance from the Government. Thus, a major administrative issue was resolved, and another significant contribution to the Nation's health was made by the industry.

The remaining unanswered question was whether to recommend that manufacturers continue making the monovalent vaccine then being produced solely to fulfill military contracts or to recommend production for civilian use of a polyvalent vaccine including the Asian strain. The opinion of the National Institutes of Health was that a polyvalent vaccine was preferable from an immunological standpoint, but the manufacturers were doubtful of their ability to produce large quantities of an effective polyvalent vaccine in the short time that remained. The National Institutes of Health conceded

Probable route of Asian influenza virus seeding, as of July 22, 1957.



that a monovalent vaccine would be preferable if the mortality associated with Asian influenza were to rise significantly. It seemed prudent as well as practical, therefore, to recommend a monovalent vaccine of the Asian strain for civilian use after the military needs had been met.

These were the crucial issues; the decisions were made by the Surgeon General. It was recognized also that these decisions should be "hedged" to reduce the adverse effects of rising influenza mortality, a possibility that could never be excluded. For this reason, the Division of Biologics Standards prepared a list of additional facilities that could produce influenza vaccine if the situation became more serious. It was believed that a mandatory allocation system for vaccine distribution and funds for purchase of vaccine and for public immunization clinics—all of which would also be necessary in the event of a grave emergency—could be obtained with relative speed if the situation ultimately warranted them.

On July 19 key officials of the Public Health Service discussed with the Under Secretary of

Health, Education, and Welfare the plans of the Service, the American Medical Association, the State health officials, and the vaccine manufacturers to cooperate in an effort to control or minimize the expected epidemic and to utilize the opportunities for research that could be foreseen.

On July 23 the World Health Organization sent a circular letter describing the influenza situation and suggesting that "countries with good facilities for large-scale vaccine production should, after satisfying their priority requirements, make available at the lowest economic price any surplus vaccine for priority groups in countries less favorably situated."

On July 25 the Division of General Health Services was designated the "focal point" in the Bureau of State Services for information about BSS influenza activities. A memorandum from the National Institutes of Health of the same date reported that vaccine manufacturers were obtaining higher yields in terms of CCA units as they gained experience with the Asian strain, an optimistic report with respect to potential vaccine production. A larger out-

put or higher potency, or both, than heretofore anticipated now seemed ultimately feasible.

On July 26 the chairman of the Committee on Control of Infectious Disease, American Academy of Pediatrics, met with officials of the Office of the Surgeon General to discuss vaccination against influenza. The Service agreed to provide the committee with all relevant information as it became available; the committee in turn agreed to develop technical advice for the guidance of pediatricians with respect to vaccination.

On July 30 the Surgeon General wrote to all State and Territorial health officers summarizing developments in the influenza situation and advising them of a forthcoming public announcement of the Service campaign to encourage maximum use of influenza vaccine. On August 1 a representative group of State directors of health education met with the Assistant to the Surgeon General for Information and other officials in Washington, D. C., to learn in detail of the plans the Service was making to encourage use of the vaccine when it became available. The Public Health Service expected a major share of this campaign to be in the hands of the States, with materials and national efforts provided by the Service.

On August 2 the Service issued a statement to the press to launch its campaign of public information and health education, and the Surgeon General again met with the press en masse. It was then possible to state that the influenza vaccine manufacturers expected to produce about 8 million cubic centimeters by mid-September, half of which would be available for civilian use.

A meeting of representatives of the Armed Forces, Veterans Administration, and the Public Health Service on August 2 was devoted principally to the question of influenza vaccine dosage. The judgment of the Office of the Surgeon General, after reviewing studies reported by military, civilian, and Service investigators, was that inoculation of 1 cc. of monovalent Asian influenza vaccine with a strength of 200 CCA units was the most effective and practical dosage to recommend.

On August 6 the Surgeon General reviewed the situation in a conference with the Secretary of Health, Education, and Welfare. On the

next day the Surgeon General and members of his immediate staff met with a committee representing the American Hospital Association to discuss the part hospitals could play in the care of the sick in the event of a serious epidemic.

Resources Readied for Epidemic

The Bureau of State Services reported on August 9 the first evidence of influenza occurring in epidemic proportions among the general population; previous outbreaks were among such "closed" groups as summer camps and naval vessels. On the same day the chief of the Civilian Health Requirements Unit completed an analysis of inventory increases by antibiotics manufacturers in anticipation of greater needs for treatment of complications of influenza. It was estimated that from 25 to 40 percent more antibiotics than usual would be on hand during the fall and that inventories could be further increased to from 40 to 100 percent above normal requirements within 30 to 60 days. The Surgeon General recommended to the Office of the Secretary of Commerce on August 9 that the export of Asian influenza vaccine be controlled while it remained in short supply.

On August 12, by individual letters, the Surgeon General asked the vaccine manufacturers to cooperate with the Public Health Service in the maintenance of a voluntary system of equitable interstate allocations of vaccine so long as it remained in short supply. Plans for this system had been developed by the Bureau of State Services. All manufacturers agreed to cooperate.

On August 13 the Surgeon General called a special meeting of all State and Territorial health officers to consider plans for the prevention and control of influenza. This action was taken pursuant to authority contained under section 312 of the Public Health Service Act. Preparations for the meeting on August 27-28 were a major item of business during the rest of the month.

On the following day, the Public Health Service met with more than 50 representatives of official, voluntary, and professional groups in the fields of health, education, and welfare to plan cooperative efforts to deal with the anticipated epidemic. Much of the smooth function-

ing of the professional groups involved during the months ahead and the lack of alarm or hysteria on the part of the public may be attributed to the immediate and continuing response of the national organizations represented at this meeting.

On August 14, also, the Surgeon General appeared before the Committee on Appropriations of the Senate to testify with respect to the President's request for additional funds for influenza activities. The committee had before it the Supplemental Appropriation Bill, 1958, which had been passed by the House of Representatives. As finally enacted, this bill provided \$800,000 in additional Public Health Service funds:

| | |
|--|-----------|
| Production and distribution of diagnostic reagents ----- | \$225,000 |
| Influenza surveillance and laboratory services----- | 385,000 |
| Data collection and dissemination----- | 80,000 |
| Public information and health education---- | 110,000 |

In addition, transfer to influenza activities of \$275,000 previously appropriated for communicable disease control was authorized. Standby authority was also granted to transfer as much as \$2 million of emergency funds available to the President. Half was intended to defray the expense of calling several hundred Public Health Service reserve officers to active duty for loan to the States if the situation should worsen, and half was contemplated for purchase of medical supplies and equipment to be made available to States and communities in the event of a grave emergency.

On August 16 Public Health Service staff members met with representatives of the Army, the Committee on Disaster Studies of

the National Academy of Sciences-National Research Council, the University of Pennsylvania (Project Big Ben), and the American Medical Association to discuss proposals for a study of the effects of an influenza epidemic on community organization and functioning. This study was later conducted, primarily by the Service.

On August 21 the Surgeon General forwarded to the President's adviser on personnel his recommendations with respect to influenza immunization for Federal employees, which had been developed after consulting the Civil Service Commission, the Federal Personnel Council, and others. On August 23 the Bureau of State Services reported influenza among school children in Louisiana and Mississippi communities where schools open during the summer before the fall harvest season begins. This development was correctly believed to foreshadow similar effects after schools opened in other communities during the fall.

With the special conference on influenza of the Surgeon General with the State and Territorial health officials on August 27-28, the Asian influenza program of the Service moved from its developmental phase into its operational period. The relevant information had been received and evaluated, the alternatives had been established, the major decisions had been made, the individuals and groups involved had been alerted, the necessary control activities had been started in the Service and elsewhere, and a campaign of public information and education had begun. A comprehensive account of the subsequent activities, however, must await a later diarist.

Income Tax Regulations on Medical Deductions

Internal Revenue Regulations which govern deductions for medical and dental expense have been published in the Federal Register, December 14, 1957 (22 FR 10054). They are sections 1.213 and 1.213-1 of title 26 of the Internal Revenue Code of 1954.

Medical care is defined, a special rule for decedents is spelled out, and examples illustrative of the regulations are included.

Asian Influenza Surveillance

ALEXANDER D. LANGMUIR, M. D., MARIO PIZZI, M. D., WILLIAM Y. TROTTER, M. D.,
and FREDERICK L. DUNN, M.D.

IN MAY 1957 immediately after Dr. Maurice R. Hilleman, then with the Walter Reed Army Institute of Research, identified influenza viruses from the Hong Kong epidemic as "distinctly different from type A strains previously isolated from this country and Europe," steps were undertaken to meet the potential threat of an epidemic in the United States. It was anticipated that the new strain would be introduced into this country constantly by travelers returning from epidemic areas in the Far East. Single sporadic cases would probably be commonplace among such persons but difficult to recognize. Localized outbreaks among selected highly crowded population groups, particularly in the military forces, could also be expected, but no extensive epidemic spread was thought likely until fall.

All Epidemic Intelligence Service officers and all epidemiological personnel of the Communicable Disease Center, both at headquarters and in the field, were alerted for first priority duty in the investigation of influenza and influenza-like disease cases and outbreaks. During June few reports of cases were received, and these largely concerned personnel on military bases and ships. The first outbreaks appeared, surprisingly, among the crews of several destroyers at Newport Naval Station, R. I. In mid-June sharp outbreaks occurred among Navy recruits in San Diego and Army recruits at Fort Ord, Calif. At the end of June, an outbreak de-

veloped among high school girls at a conference on the campus of the University of California School of Veterinary Medicine at Davis, Calif. A nurse epidemiologist with the Communicable Disease Center participated with California State health officials in the investigation of this outbreak.

From June 28 to July 3 an outbreak of influenza appeared in Grinnell, Iowa, at a Westminster Fellowship Conference, which was attended by 1,680 delegates from more than 40 States and 10 foreign countries. A delegation of more than 100 students from California, at least one of whom had been exposed at the Davis conference, developed influenza en route and clearly introduced it to the other delegates. When this conference was disbanded, the infection was carried to all parts of the country. It was evident by this time, however, that the infection was being seeded in manifold ways.

In the early part of July, it became apparent that the routine morbidity reporting channels from the States to the National Office of Vital Statistics were not sufficient to handle the steadily increasing load of detailed reports. Accordingly, the Influenza Surveillance Unit was formally established in the Communicable Disease Center for the purpose of supplementing, but in no way replacing, the regularly established functions of the National Office of Vital Statistics. This surveillance unit was designed along lines similar to those initiated for the poliomyelitis surveillance reports in 1955. From its inception, the Influenza Surveillance Program was a joint undertaking of the Epidemiology Branch, with all of its Epidemic Intelligence Service officers and field personnel reporting continually and in detail, and the Respiratory Disease Unit of the Virus and Rick-

The authors are all with the Epidemiology Branch, Communicable Disease Center, Public Health Service, where Dr. Langmuir is branch chief and Dr. Pizzi, chief of the Surveillance Section. Drs. Trotter and Dunn are both in the Influenza Surveillance Unit.

etisia Section of the Laboratory Branch, with its rapidly expanding system of collaborating influenza diagnostic and reference laboratories.

The information from these extensive sources was consolidated with the large amount of data reported directly to the National Office of Vital Statistics from the States and military services. Lengthy reports were prepared weekly and distributed to all State health officers, State laboratory directors, State epidemiologists, and many others having interests or responsibility in the study and control of influenza. The first of these reports was published July 9, 1957.

Nationwide Spread

During July, Asian strain influenza was disseminated widely through the country. Outbreaks occurred chiefly in closed population groups such as children's camps and military installations. California camps were most heavily affected.

From July 11 to 18 an International Boy Scout Jamboree held at Valley Forge, Pa., was attended by a total of 53,000 Scouts and leaders from every State and from several foreign countries. At the beginning of the encampment there was evidence of influenza among Scouts from Sacramento, San Francisco, and Los Angeles, Calif., and from Louisiana and Puerto Rico. En route to the Jamboree, when the Scouts were in close contact for extended periods of time, many became ill. Laboratory studies have since demonstrated that their disease was Asian influenza. During the encampment many additional cases occurred among contacts of the originally involved groups, but no large epidemic developed in the camp. Three Epidemic Intelligence Service officers were stationed at Valley Forge to gather basic epidemiological and laboratory data. Additional cases occurred among Scouts on the way home, although again most of these were in the California and Louisiana contingents.

In the latter part of July, a number of new outbreaks occurred in children's camps throughout the country. Most of these could have been related either to the Boy Scout Jamboree or to other previously known outbreaks. There was very little evidence of community-

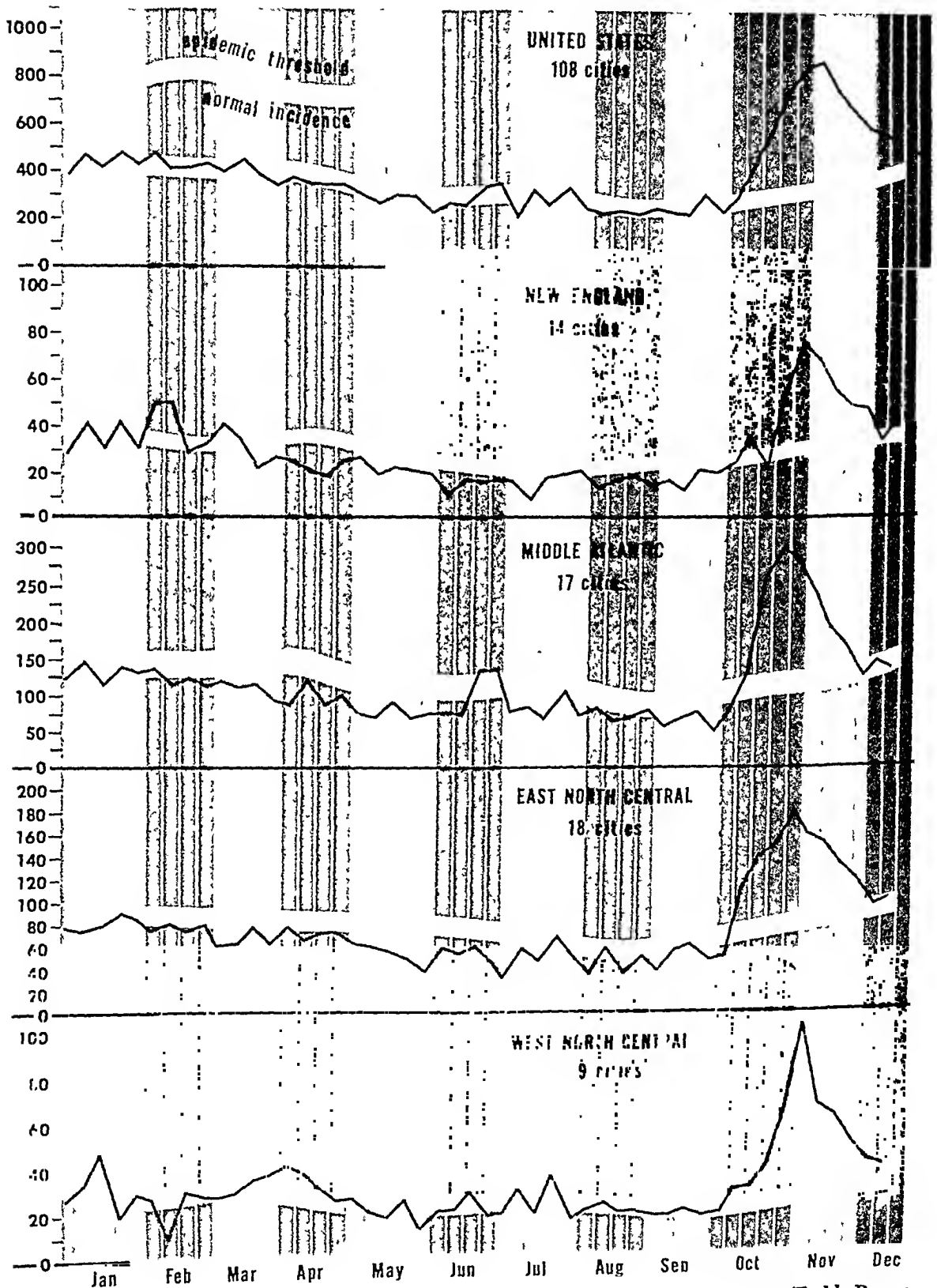
wide outbreaks affecting children and adults during July.

Influenza continued to appear in sporadic fashion during August. Certain incidents increased its spread and gave warning of future developments. Migrant workers, exchange students, Scouts, and others continued to disseminate the disease. However, during early August a major communitywide outbreak occurred in Tangipahoa Parish, La. It was readily apparent that this outbreak was related to the opening of summer school sessions in this rural area where children were required to work at the harvest later in the season. Spread from school children to other members of families was clearly demonstrated. Shortly afterward, nearby New Orleans began to experience the first major urban outbreak. These outbreaks were investigated by Dr. J. D. Martin of the Louisiana State Department of Health and two members of the Epidemic Intelligence Service. The belief that a nationwide epidemic might well begin with the general opening of public schools was further supported when several Mississippi counties also experienced communitywide outbreaks originating in schools that reopened in mid-August.

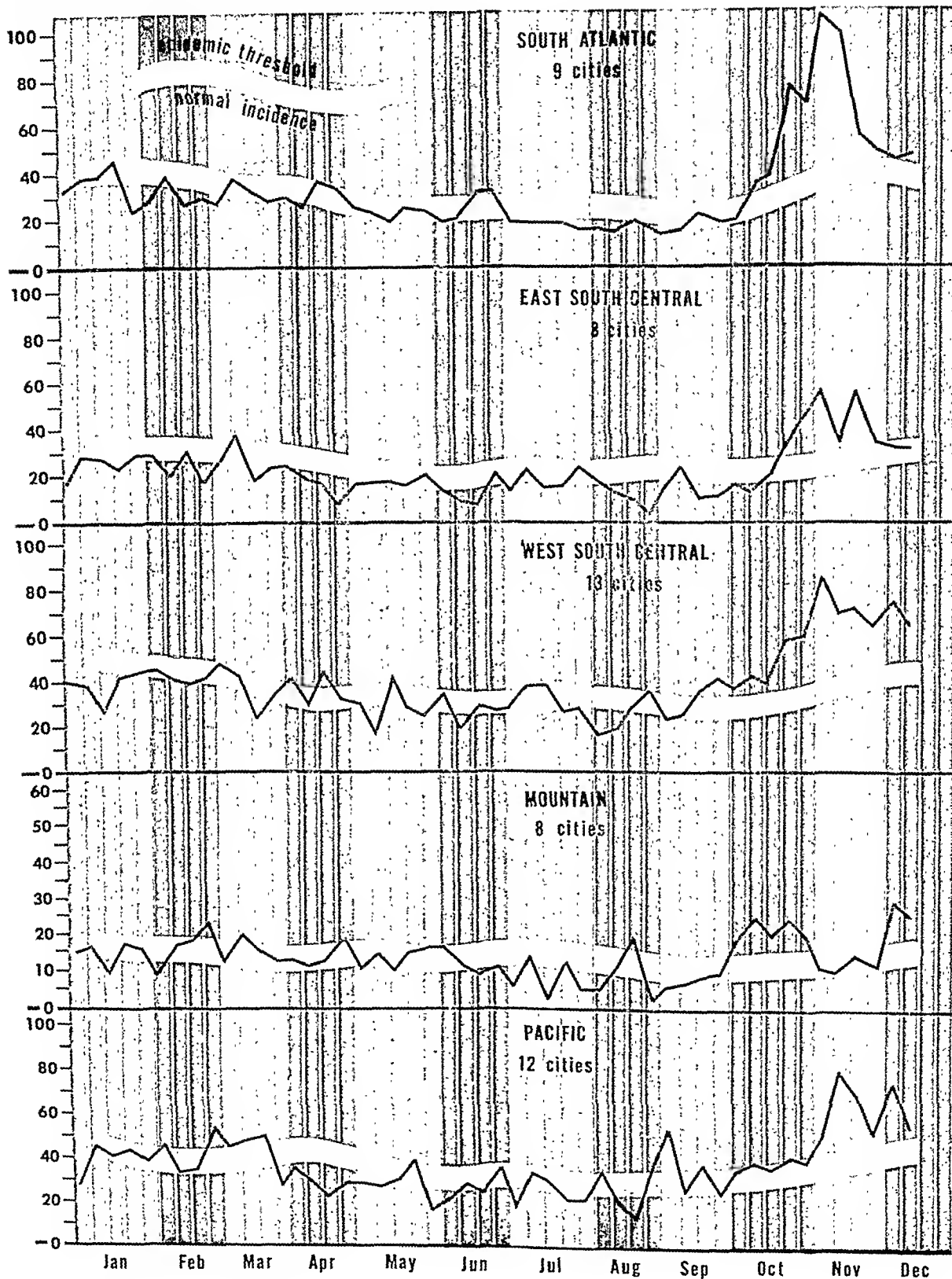
By late August there was no longer any doubt that a major nationwide influenza epidemic could be expected. For this reason, the Surgeon General of the Public Health Service called members of the Association of State and Territorial Health Officers to a special meeting on influenza to be held August 27 and 28. The purpose of this meeting was to review the influenza situation, to consider methods of control, and to coordinate all health activities to this end. One recommendation of the meeting resulted in a broadening and intensification of the CDC influenza surveillance activities. It was recommended that the States (a) adopt a program of epidemic reporting first by counties to the States and from them to the Public Health Service; (b) adopt a standard method of gathering and reporting information on outbreaks; and (c) sample absentee rates in selected schools and industries.

To facilitate this reporting by the States, the Communicable Disease Center designed a set of five forms. One of these was to be used for influenza reporting to the National Office

Figure 1. Weekly pneumonia and influenza deaths



in the United States through December 13, 1957.



of Vital Statistics and to the Center, and the others were to aid States in collecting data. On September 17 instructions and samples of each form were attached to the influenza surveillance report and sent to each State health officer, along with blanks for obtaining additional forms. Approximately 10,000 forms were mailed to the States to initiate their reporting systems, and an additional 45,000 have been sent to them since then in response to direct requests. Information gained from these forms has made it possible to estimate the geographic spread of the disease through the States.

In early September, as schools and colleges began to open, the number of influenza outbreaks increased greatly. Reports of new introductions of the disease by Mexican migrant laborers and foreign students continued. Communitywide epidemics spread further in the Mississippi-Louisiana region. Influenza vaccine was now being released in quantity, and weekly production and release figures were included in the surveillance report. In order to

measure the effects of influenza precisely, weekly analyses were prepared of excess mortality from influenza and pneumonia in 108 major United States cities (fig. 1). Shortly after the first release of vaccine, reports began to appear of nonallergic vaccine-associated deaths. Prompt investigation of these reports showed them to be poorly substantiated, and this fact was noted in the surveillance reports.

During the month of September, many Epidemic Intelligence Service officers participated in studies of local epidemics in order to determine further the behavior of the disease. Epidemic Intelligence Service officers also participated with the CDC Laboratory Branch in studies of vaccine effectiveness at Atlanta Federal Penitentiary and conducted studies of vaccine reactions in various population groups.

Early in October excess influenza and pneumonia mortality began to rise in the West South Central division, and by the end of the month the Nation as a whole was clearly experiencing increased deaths. Voluntary reporting

Figure 2. Localized outbreaks and countywide epidemics of Asian influenza, through October 27, 1957.

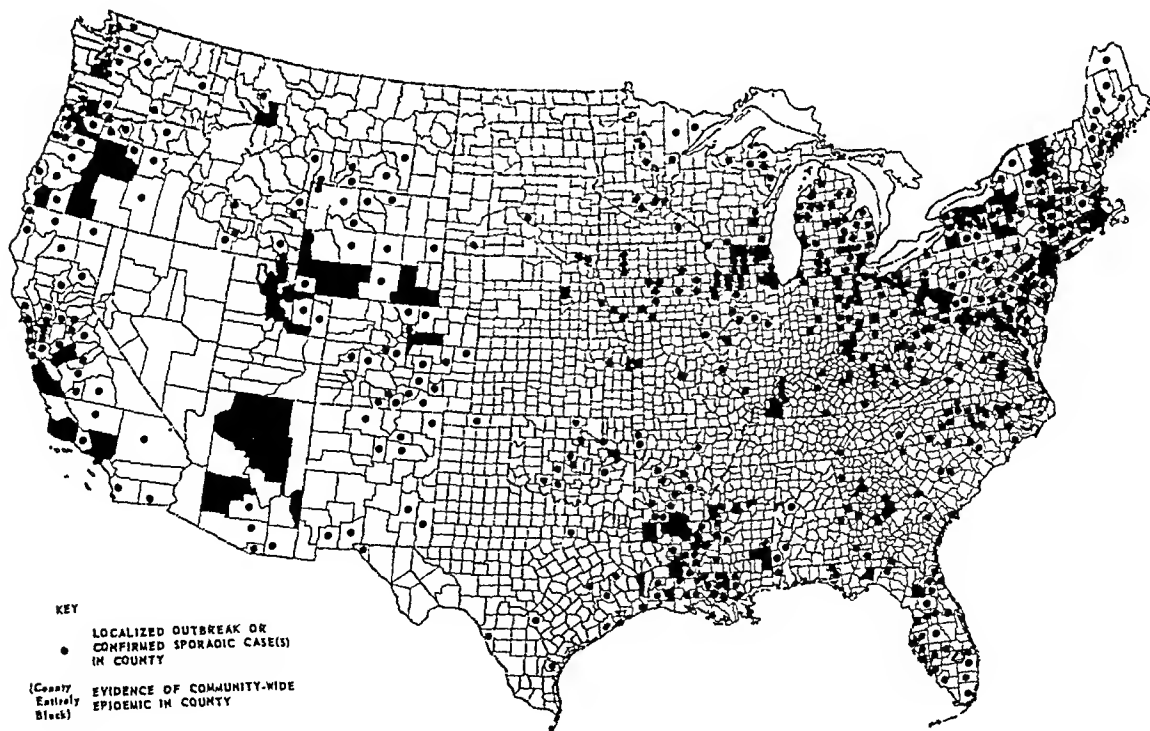
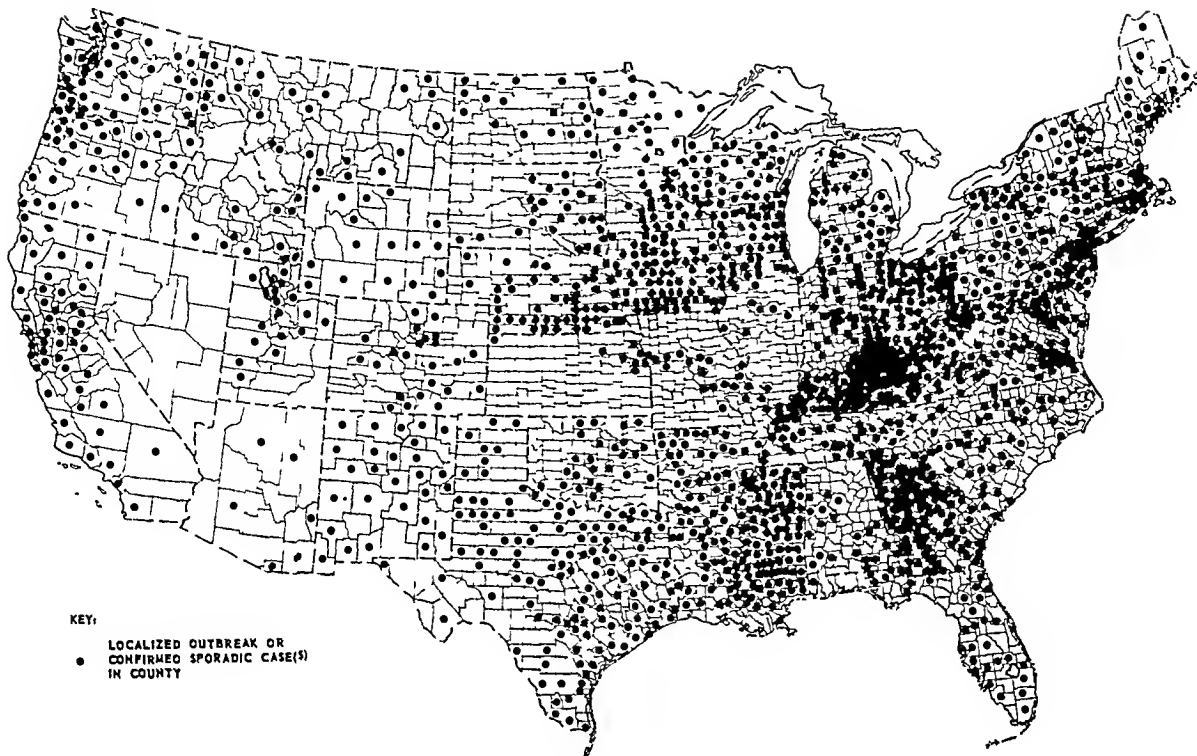


Figure 3. Geographic spread of Asian influenza, by county, through December 2, 1957.



of detailed influenza case histories resulted in a collection of valuable information regarding deaths and complications. This information was interpreted and published in the influenza surveillance reports to aid in treatment and stimulate further investigations. On October 15, through cooperation with certain corporations, it was possible to present industrial absentee data for 36 major United States cities. Several cities showed significantly increased absenteeism early in October, and most cities were affected before November. By this time influenza had reached at least 20 percent of the counties, and the county map (fig. 2) was beginning to lose its significance as an indicator of incidence. At this time effort to distinguish localized outbreaks from countywide epidemics was discontinued, and a new map was made to show simple geographic spread by counties (fig. 3).

A further measure of the epidemic was provided by the U. S. National Health Survey as preliminary data which the Influenza Surveillance Unit was permitted to publish. From all the available methods of measurement, it was

apparent that the epidemic was reaching a peak early in November, and by late November mortality, absenteeism, and new cases appeared to be on the decrease.

Despite the decline of the epidemic in late November 1957, the surveillance program continued in force because of the possibility of a second epidemic wave. The surveillance group continued its efforts to describe the epidemic and to define those areas in need of immediate or retrospective study.

Discussion

Although much data remain to be gathered, it is already possible to give a general picture of the 1957 epidemic as obtained through surveillance methods. Morbidity has been high, with clinical cases in approximately 25 percent of the population. But the mortality has been relatively low, in the range of 7,000 excess deaths from pneumonia and influenza. There has been no evident change in the severity of the cases with the progress of the epidemic, although it was possible to define certain special

risk groups such as pregnant women and persons with chronic cardiac and respiratory conditions. The present epidemic will probably result in more deaths than the A' influenza epidemic of 1953 and may eventually prove to be more severe than the A epidemic of 1943. However, it is in no way comparable to the pandemic of 1918 and is less severe as measured by mortality than nine epidemics that have occurred since 1920. There has been a rather

consistent pattern of initial involvement of high school children, followed by spread to elementary school children and adult populations. Industrial absenteeism increased a few days before excess mortality rose in a given urban community. Many deaths have occurred in the older age groups and in the debilitated. Staphylococcal pneumonia has been a prominent cause of death, although nonbacterial pneumonia has resulted in many deaths.

Sure Cures, 1918

"The present epidemic has given rise to the publication of numerous 'sure cures' and methods more or less plausible to the lay mind. The advocates of some of these have addressed long communications to Secretary McAdoo, to Surgeon General Blue, to the War Department, or other Government agencies. Hundreds of them have written to editors of newspapers. In general the suggestions fall into several groups.

"First comes the individual who has a specific remedy, the formula of which he is ready to give to the world for a price. One such writer reminds the Surgeon General of the million dollars that Congress has appropriated for combating influenza, and offers to sell his secret for 'a reasonable sum.'

"Next comes the person with the pseudo-scientific treatment, sometimes 'isotonic sea water,' sometimes 'ozono therapy,' and again

'harmonic vibrations.' One such writer, well known to the New York health authorities, addressed the Surgeon General from his present residence, the State Hospital for the Insane.

"The list might be continued, but the suggestions are largely variations and repetitions of what has already been cited.

"The United States Public Health Service urges the public to remember that there is as yet no specific cure for influenza, and that many of the alleged 'cures' and remedies now being recommended by neighbors, nostrum vendors, and others do more harm than good. The chief reliance must be on fresh air, nutritious food, plenty of water, cheerful surroundings, and good nursing. If any specific like a vaccine or serum is found to have value the Public Health Service will give the matter wide publicity."

—*Public Health Reports, November 8, 1918.*

Data on Acute Upper Respiratory Diseases

G. St.J. PERROTT and FORREST E. LINDER

IN AN unscheduled but propitious development, the U. S. National Health Survey is publishing current statistics which, in a tangential way, contribute notably to the aggregate of information on the influenza epidemic.

The data, the first to come from the new survey program, add several dimensions to the body of knowledge on communicable diseases. They come directly from a source we have not previously been able to tap on a national scale: the people affected by the diseases. They permit an association of incidence and prevalence with age and with two criteria of severity: bed disability and medical attendance. They provide a base for measuring the social and economic cost of the acute upper respiratory infections, including influenza.

The National Health Survey is not set up as an epidemic reporting system. Rather, it is designed to provide a continuing source of fundamental statistical information on the health of the American people in relation to important demographic, medical, social, and economic characteristics. This it will do in a series of reports which will begin to appear later in 1958. These reports will be based on data accumulated over one or more calendar quarters.

One part of the National Health Survey is a continuing household interview survey of a representative sample of the population, and it is

this project that has provided current statistics on acute upper respiratory diseases. The household interview phase has been under way nationwide since July 1, 1957.

Background

Household interviewing is continuous in order to increase accuracy, improve efficiency, and permit accumulation, over various periods of time, of data necessary for study of different health problems. Partly because budgetary considerations do not permit a sample sufficiently large to yield current estimates for items of low incidence or prevalence, it was not contemplated that tabulations by week or month would be made. However, when it appeared that in the fall of 1957 influenza-like diseases would reach a higher than usual level of frequency, the survey staff decided to investigate the possibility that the household interview data would yield useful current information about these diseases. The investigation took the form of a special tabulation of the weekly receipts of household interview schedules which showed acute upper respiratory diseases severe enough to cause 1 or more days of bed disability. (Roughly, the diseases included are International Statistical Classification categories 470-493 and 500 and also a special category for "virus" not otherwise specified.)

The household interviewing is conducted for the Public Health Service by the Bureau of the Census, which designs and selects the sample and processes the data in accordance with specifications established by the Service. The interviewing is done by trained lay interviewers, and the sample interviewed each week is repre-

Mr. Perrott is chief of the Public Health Service's Division of Public Health Methods, in which is located the U. S. National Health Survey. He was director of the national health survey conducted in 1935-36, the last previous effort to collect comprehensive health data nationwide. Dr. Linder is director of the U. S. National Health Survey.

risk groups such as pregnant women and persons with chronic cardiac and respiratory conditions. The present epidemic will probably result in more deaths than the A' influenza epidemic of 1953 and may eventually prove to be more severe than the A epidemic of 1943. However, it is in no way comparable to the pandemic of 1918 and is less severe as measured by mortality than nine epidemics that have occurred since 1920. There has been a rather

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"The United States Public Health Service urges the public to remember that there is as yet no specific cure for influenza, and that many of the alleged 'cures' and remedies now being recommended by neighbors, nostrum vendors, and others do more harm than good. The chief reliance must be on fresh air, nutritious food, plenty of water, cheerful surroundings, and good nursing. If any specific like a vaccine or serum is found to have value the Public Health Service will give the matter wide publicity."

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responding roughly to the 4 calendar months of July, August, September, and October.

Although the number of cases in the sample during July and August was quite small and the errors of sampling are therefore relatively high, the frequency distributions in table 2 point to an increase in the length of bed-stays during October as compared with earlier months. For example, the percentages of cases resulting in 3 or more days in bed were about 46 in July, 42 in August, 44 in September, and 56 in October.

For the whole of the 17-week period from June 30 to October 26 only about 1 case in 8 kept the person in bed for a week or more. This seems to confirm evidence from many other sources that the great majority of the cases during this period were mild.

Age Variations

Acute upper respiratory diseases causing 1 or more days of bed disability occurred more frequently among children and adolescents than among adults during the entire 4-month period. As shown in figure 2, the weekly rate of occurrence of new cases per 1,000 population was highest for the age group 5-19 years, somewhat lower for the age group 0-4 years, and lowest for the two age groups over 20 years old.

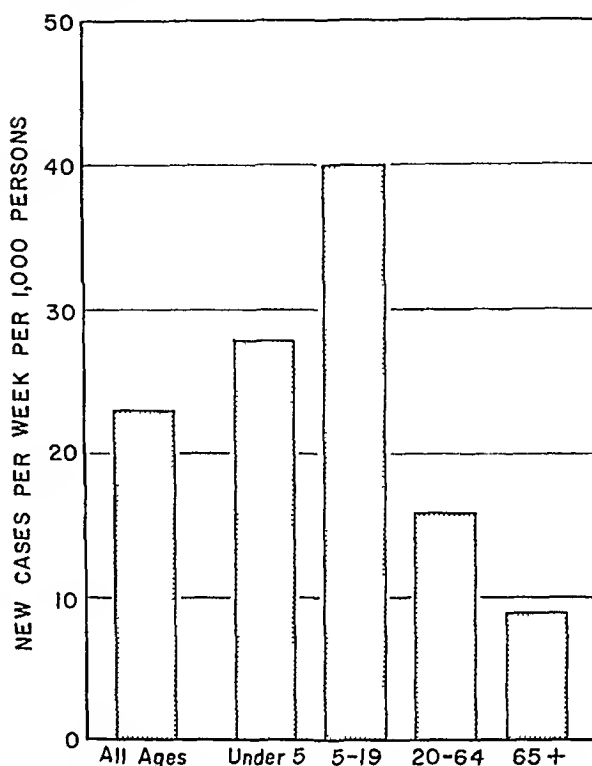
Although the average rate of occurrence of acute respiratory diseases for the 4-month period varied with age, little difference is found

Table 2. Acute upper respiratory diseases ¹ involving 1 or more days in bed: percentage distribution of new cases by length of time in bed, United States, June 30-October 26, 1957

| Number of days in bed | Period of onset | | | | |
|-----------------------|-----------------|----------------|----------------|------------------|------------------|
| | June 30-Oct. 26 | June 30-Aug. 3 | Aug. 4-Aug. 31 | Sept. 1-Sept. 28 | Sept. 29-Oct. 26 |
| All cases----- | 100 | 100 | 100 | 100 | 100 |
| 1-2----- | 48 | 54 | 59 | 55 | 44 |
| 3-6----- | 38 | 36 | 30 | 32 | 42 |
| 7 or more----- | 13 | 10 | 12 | 12 | 14 |

¹ Including also influenza, pneumonia, and other similar conditions.

Figure 2. Acute upper respiratory diseases ¹ involving 1 or more days in bed: average number of new cases per week per 1,000 persons, by age group, United States, June 30-October 26, 1957.



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among the rates for the different age groups during July and August. The rates of occurrence for the four age groups are all quite low and similar in size (table 3). Although these rates may appear to vary inversely with age, care should be taken in inferring from these data any differences between the age groups for the July-August period, since these low rates are subject to relatively large sampling errors.

During October the age differences were marked. The average weekly rate of occurrence of new cases was highest for the age group 5-19 years, which had a weekly rate of 111 cases per 1,000 persons. The 0-4 year age group was next, with a weekly rate of 62 cases per 1,000 persons, while the two older age groups had the lowest rates, 41 for the age group 20-64 years and 21 for the age group 65 years and above. It should be noted that the age group

Table 1. Acute upper respiratory diseases¹ involving 1 or more days in bed: number of new cases and average number of persons in bed each day, by week, United States, July 1–December 14, 1957

| Week | New cases involving 1 or more days in bed (thousands) | Average number of persons in bed each day (thousands) |
|-----------------|---|---|
| June 30–July 6 | 1, 105 | 319 |
| July 7–13 | 846 | 311 |
| July 14–20 | 578 | 253 |
| July 21–27 | 1, 203 | 342 |
| July 28–Aug. 3 | 1, 264 | 425 |
| Aug. 4–10 | 955 | 339 |
| Aug. 11–17 | 1, 181 | 447 |
| Aug. 18–24 | 1, 758 | 675 |
| Aug. 25–31 | 2, 159 | 654 |
| Sept. 1–7 | 1, 819 | 651 |
| Sept. 8–14 | 2, 279 | 856 |
| Sept. 15–21 | 4, 487 | 1, 152 |
| Sept. 22–28 | 3, 952 | 2, 094 |
| Sept. 29–Oct. 5 | 7, 773 | 2, 845 |
| Oct. 6–12 | 9, 712 | 4, 551 |
| Oct. 13–19 | 11, 933 | 5, 699 |
| Oct. 20–26 | 11, 033 | 5, 665 |
| Oct. 27–Nov. 2 | 9, 808 | 6, 372 |
| Nov. 3–9 | 8, 297 | 5, 262 |
| Nov. 10–16 | 5, 648 | 3, 389 |
| Nov. 17–23 | 5, 305 | 2, 867 |
| Nov. 24–30 | 3, 339 | 2, 518 |
| Dec. 1–7 | 4, 271 | 2, 276 |
| Dec. 8–14 | 3, 667 | 1, 886 |

¹ Including also influenza, pneumonia, and other similar conditions.

tion of stay in bed to increase slightly as the epidemic progressed.

A rather startling aspect of these national figures on acute upper respiratory disease cases is the size of the numbers. Two things must be borne in mind in this connection. First, the statistics relate to the entire civilian population of the country, approximately 168 million in number; and, second, the estimates relate to some of the commonest ailments that mankind is heir to, as well as Asian influenza. In any winter, colds, sore throats, acute bronchitis, and similar conditions will probably affect a very sizable portion of the population, many of them more than once. Since these data from the National Health Survey are available for the first time this winter, there is no way of measuring the extent to which the number of respiratory cases was higher than usual. Nevertheless, it is an impressive fact that on approximately 104 million occa-

sions between June 30 and December 14 people took to their beds for a day or more because of illnesses of this type.

What fraction of these cases were influenza of the Asian strain? The National Health Survey household interviews yield no reliable data on this point. However, they provide the basis for interesting speculation on related matters. For example, if there is evidence from other sources that x percent of the upper respiratory disease cases during this period were Asian influenza, the survey results would suggest that by December 14 approximately $0.62x$ percent of the entire civilian population of the country had acquired some natural immunity to the Asian strain.

During this same 24-week period acute upper respiratory diseases accounted for about 363 million days of illness in bed. This total is equivalent to 994,000 person-years lost from usual activities, such as work, housekeeping, or school, and it does not include days of reduced activity when the person was incapacitated but did not go to bed. Using such data it would be possible on the basis of various plausible assumptions to make estimates of the monetary loss to the economy as a result of the upper respiratory diseases in an epidemic winter.

Length of Stay in Bed

The data on length of stay in bed tallied from the National Health Survey questionnaires provided a measure of the severity of cases of acute upper respiratory diseases. This information has to be treated with caution, however, since the bed stay for some of the cases had not terminated at the beginning of the interviewing week. In order to deal only with cases likely to be complete, analysis of length of stay in bed is restricted to cases that began during the second week before the week of interview. Since these cases began at least 7 days before the end of the 2-week period, cases requiring less than 7 days in bed were complete. The most that can be said about the length of time in bed for the other cases is that it was 7 days or more. Table 2 shows the frequency distribution of length of stay in bed for cases starting during 4 periods cor-

Table 5. Acute upper respiratory diseases ¹ involving 1 or more days in bed: number and percentage of cases which were medically attended among all new cases, by date of occurrence, United States, June 30–October 26, 1957

| Time of occurrence | New cases (thousands) | Medically attended (thousands) | Percent medi- cally at- tended |
|--------------------|--------------------------|--------------------------------------|---|
| June 30–Oct. 26 | 64, 037 | 32, 991 | 52 |
| June 30–July 20 | 2, 529 | 1, 629 | 64 |
| July 21–Aug. 3 | 2, 467 | 1, 696 | 69 |
| Aug. 4–17 | 2, 136 | 1, 305 | 61 |
| Aug. 18–31 | 3, 917 | 2, 260 | 58 |
| Sept. 1–14 | 4, 098 | 1, 889 | 46 |
| Sept. 15–28 | 8, 439 | 3, 477 | 41 |
| Sept. 29–Oct. 12 | 17, 485 | 8, 323 | 48 |
| Oct. 13–26 | 22, 966 | 12, 412 | 54 |

¹ Including also influenza, pneumonia, and other similar conditions.

were similar and relatively low for each of the age groups. During October, however, substantial differences between the age groups occurred. For the age group 5–19 years, the average number of persons in bed each day was 51 per 1,000 persons, more than twice the figure for any of the other age groups. Almost one-half of the total number of bed-days of disability that occurred during October were experienced by persons in this age group, although, as was mentioned previously, the age group constitutes only one-quarter of the country's population.

Medical Attendance

In the household interviewing project of the National Health Survey, medically attended cases are those for which a doctor was consulted at home, at work, at the physician's office, in a clinic, or over the telephone.

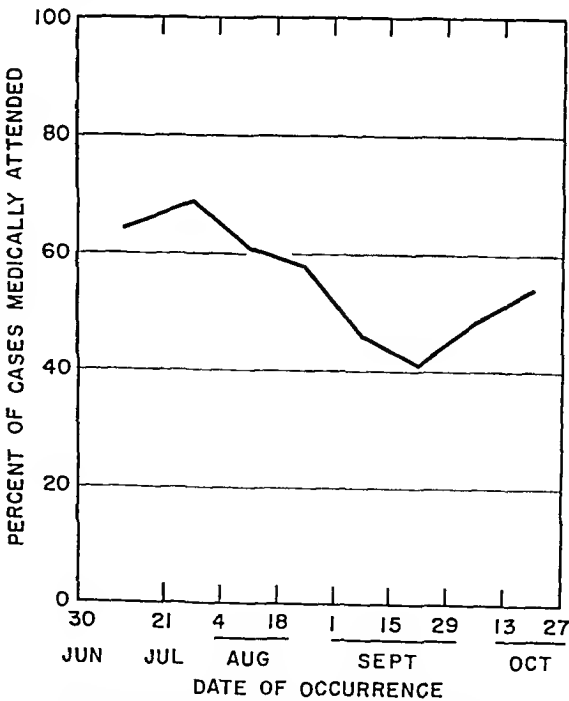
Table 5 and figure 3 show, by date of occurrence, the proportion of cases that were medically attended among all new cases of upper respiratory conditions causing bed disability. During early and middle summer, when the frequency of these conditions was low, the proportion medically attended was around 60 to 70 percent. The proportion decreased to about 40 percent in late September and then turned upward to about 50 percent in October,

when the reported frequency of bed cases of acute respiratory conditions was at a peak.

For the entire period the proportion of medically attended cases was higher for the very young and for persons over age 65 years than for persons in the school or working ages. The proportion of cases medically attended decreased in September and increased in October within each age group as well as in the total population (table 6).

During the period of this report there were undoubtedly changes in the proportions of the various types of conditions reported under the broad category of acute upper respiratory conditions. This, together with changes in the volume of acute conditions, is probably reflected in the observed pattern of medical attendance. There are no comparable data for previous years, and the reason for the pattern of medical attendance seen here is a matter of conjecture.

Figure 3. Acute upper respiratory diseases ¹ involving 1 or more days in bed: percentage of cases which were medically attended among all new cases, by date of occurrence, United States, June 30–October 26, 1957.



¹ Including also influenza, pneumonia, and other similar conditions.

Table 3. Acute upper respiratory diseases¹ involving 1 or more days in bed: average number of new cases per week and average number of new cases per week per 1,000 persons, by time period and age group, United States, June 30–October 26, 1957

| Time period and age group | Average number of new cases per week (thousands) | Average number of new cases per week per 1,000 persons in age group |
|---------------------------|--|---|
| <i>June 30–Oct. 26</i> | | |
| All ages..... | 3, 927 | 23 |
| 0-4..... | 534 | 28 |
| 5-19..... | 1, 797 | 40 |
| 20-64..... | 1, 460 | 16 |
| 65 and over..... | 136 | 9 |
| <i>June 30–Aug. 31</i> | | |
| All ages..... | 1, 243 | 7 |
| 0-4..... | 279 | 15 |
| 5-19..... | 406 | 9 |
| 20-64..... | 517 | 6 |
| 65 and over..... | 40 | 3 |
| <i>Sept. 1–28</i> | | |
| All ages..... | 3, 181 | 19 |
| 0-4..... | 385 | 20 |
| 5-19..... | 1, 490 | 33 |
| 20-64..... | 1, 154 | 13 |
| 65 and over..... | 152 | 10 |
| <i>Sept. 29–Oct. 26</i> | | |
| All ages..... | 10, 135 | 60 |
| 0-4..... | 1, 198 | 62 |
| 5-19..... | 4, 936 | 111 |
| 20-64..... | 3, 684 | 41 |
| 65 and over..... | 317 | 21 |

¹ Including also influenza, pneumonia, and other similar conditions.

5-19 years not only had the highest rate of occurrence but also accounted for a substantial proportion of the total number of cases. Although this age group represents only 25 percent of the total population of the country, it accounted for almost 50 percent of the total new cases that occurred during October.

The relationship between age and days spent in bed due to acute respiratory diseases presents a pattern similar to that shown by the relationship between rate of occurrence and

age. During the 4-month period the average number of persons in bed each day per 1,000 population was higher for children and adolescents than for adults (table 4). The age group 5-19 years had the highest rate, 17 persons in bed per day per 1,000 persons. The age group 0-4 years had a rate of 10 per 1,000 persons, while the age groups 20-64 and 65 and above had lower rates of 7 and 5, respectively.

During July and August the average numbers of persons in bed per day per 1,000 persons

Table 4. Acute upper respiratory diseases¹ involving 1 or more days in bed: average number of persons in bed each day and average number of persons in bed each day per 1,000 persons, by time period and age group, United States, June 30–October 26, 1957

| Time period and age group | Average number of persons in bed each day (thousands) | Average number of persons in bed each day per 1,000 persons in age group |
|---------------------------|---|--|
| <i>June 30–Oct. 26</i> | | |
| All ages..... | 1, 714 | 10 |
| 0-4..... | 201 | 10 |
| 5-19..... | 778 | 17 |
| 20-64..... | 655 | 7 |
| 65 and over..... | 80 | 5 |
| <i>June 30–Aug. 31</i> | | |
| All ages..... | 467 | 3 |
| 0-4..... | 93 | 5 |
| 5-19..... | 148 | 3 |
| 20-64..... | 201 | 2 |
| 65 and over..... | 25 | 2 |
| <i>Sept. 1–28</i> | | |
| All ages..... | 1, 281 | 8 |
| 0-4..... | 145 | 8 |
| 5-19..... | 565 | 13 |
| 20-64..... | 478 | 5 |
| 65 and over..... | 92 | 6 |
| <i>Sept. 29–Oct. 26</i> | | |
| All ages..... | 4, 681 | 28 |
| 0-4..... | 474 | 25 |
| 5-19..... | 2, 271 | 51 |
| 20-64..... | 1, 756 | 19 |
| 65 and over..... | 181 | 12 |

¹ Including also influenza, pneumonia, and other similar conditions.

Influenza Vaccine

JOSEPH E. SMADEL, M.D.

ANOTHER significant episode in the mass immunization of a large civilian population occurred during the Asian influenza epidemic. The acceptance of the current influenza vaccine program by laymen, physicians, and public health officials undoubtedly was favorably influenced by the highly successful campaigns for immunization against poliomyelitis. On the other hand, the development of Asian influenza vaccine and the production of almost 50 million ml. of this vaccine during the 7 months after the newly isolated viral agent was first brought to this country represent a remarkable feat which could have been accomplished only because of the enormous experience gained through the extensive study of influenza during the past two decades.

Dr. Thomas Francis and his associates of the Commission on Influenza of the Armed Forces Epidemiological Board have been outstanding leaders in the extended studies of influenza and in the development and demonstration of the efficacy of influenza vaccines (1). Following the pattern developed by the commission, the Army Medical Department and the Public Health Service created a series of influenza watch laboratories to assist in providing prompt and accurate information on the occurrence and spread of influenza. These watch laboratories have since been integrated with the World Health Organization's system which now encircles the globe (2).

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A little-known experiment undertaken by American influenza investigators and the vaccine producers several years ago provided additional background for the work in 1957 with Asian influenza vaccine. In 1951 England experienced a moderately severe outbreak of influenza, which was considered a possible hazard to the United States. It was decided to determine how quickly the British virus could be imported and analyzed for antigenic composition, and incorporated into a vaccine, if it were found to be different from the earlier strains of influenza virus. Accordingly, at the height of the epidemic in Liverpool, British colleagues supplied a strain which was flown to the United States and promptly distributed to the laboratories at Walter Reed Army Institute of Research and the National Institute of Allergy and Infectious Diseases, Public Health Service. The institute, in turn, sent samples to the influenza vaccine manufacturers. The self-imposed problem of the various laboratories was to produce 1 liter of vaccine of acceptable potency, sterility, and safety in the shortest possible time. The two Government laboratories accomplished their task before the end of 3 weeks and the biologic houses shortly thereafter. The various workers recognized the portent of their achievement but realized that many factors had been in their favor and that similar success might not be regularly attained.

Development of Asian Influenza Vaccine

The present influenza vaccine program must make obeisance to each of the earlier developments described above. Using the watch laboratory organization, the Army Medical Department isolated the Asian influenza virus from patients in the Far East in late April.

Table 6. Acute upper respiratory diseases¹ involving 1 or more days in bed: percentage of cases which were medically attended among all new cases, by month of occurrence and age, United States, July–October 1957

| Month | Age group | | | | |
|----------------------|-----------|-----|------|-------|--------------------------|
| | All ages | 0–4 | 5–19 | 20–64 | 65 and over ² |
| July–October..... | 52 | 59 | 51 | 48 | 58 |
| July and August..... | 62 | 71 | 69 | 53 | 57 |
| September..... | 43 | 52 | 43 | 39 | 45 |
| October..... | 51 | 55 | 51 | 49 | 65 |

¹ Including also influenza, pneumonia, and other similar conditions.

² Figures for persons 65 and over are based on small numbers of cases in any given month and should be interpreted with caution.

It is possible that part of the increased volume of new cases in September is due to a normal seasonal increase in minor respiratory conditions for which medical attention is seldom sought. The October increase in the percentage of cases attended by a physician may result from the relatively heavier impact of influenza and an accompanying increase in severity, indicated by the longer stay in bed.

It is noteworthy that the lower proportion of cases which were medically attended in the latter half of the reporting period does not imply a decreased total volume of medical care. In the last 2 weeks of October there were about 12.4 million medically attended cases (table 5). This is greater than the number of medically attended cases during the entire 9 weeks of July and August.

The 12.4 million cases with medical consultation in the last half of October are cases for which the person went to bed. Estimates from other current National Health Survey data on acute respiratory diseases show that there were about half again as many cases with medical consultation but no bed disability. It can therefore be estimated that in this concentrated period of time approximately 18 million cases of acute upper respiratory conditions had medical attention, representing a tremendous volume of consultation and treatment provided by the medical profession.

Reliability of Data

Approximate sampling errors have been calculated for the estimated number of new cases each week. The sampling error varies somewhat from week to week, but 15 percent has been a typical relative error. This means that the estimated number of new cases for 2 weeks out of 3 should be within 15 percent of the figure that would be obtained from a complete enumeration, and it would be expected to be within 30 percent of a complete count in 19 out of 20 weeks.

Relative sampling errors for average number of persons in bed each day for any given week are of the same order of magnitude as for new cases. Estimates in adjacent weeks of average number of persons in bed are not entirely independent of one another, however, whereas each weekly estimate of new cases is independent of estimates for other weeks.

The sampling error for estimated proportion of persons with 3 or more days of bed disability also varies from week to week, but it is near 10 percent.

For monthly estimates, sampling errors are about 50 percent of those for the corresponding weekly figures. For estimates which refer to the entire 4-month period, sampling errors are about 25 percent of those for corresponding weekly data.

In considering reliability of items for which sampling errors have not been presented, two suggestions are offered. First, samples in any given week are quite small; consequently, a figure for any week or for the change from one particular week to another is subject to substantial sampling error and to fairly high risk of error from nonsampling sources. Second, it is desirable to focus attention on the general level or trend indicated by the collective evidence of several adjacent weeks, rather than on the level in any single week or the change from one week to the next. Similarly, samples for some subclasses shown are small, and there is advantage in considering the pattern reflected through several related subclasses.

The estimates of sampling error presented here do not allow for errors of response and nonreporting.

meeting the requirements. Moreover, 4,600,000 ml. of vaccine (total bulk volume) was released by the Division of Biologics Standards by September 5. Production increased dramatically, and by the end of October 42,600,000 ml. bulk vaccine had passed the tests performed concurrently by the vaccine manufacturers and by the Division of Biologics Standards.

Potency and Efficacy of Vaccine

Drawing on the fund of knowledge accumulated over the years from field trials by the Commission on Influenza, it was estimated in June that the effective dose of Asian strain vaccine would probably be not less than 200 chicken cell agglutination (CCA) units when administered subcutaneously to adult human beings. Because of the difficulties encountered during the early summer in obtaining high yields of Asian virus in embryonated eggs, it seemed unlikely that a vaccine containing more than 200 CCA units of Asian antigen could be produced. Hence, the potency of the new monovalent vaccine was set at 200 CCA units per milliliter (6a).

A series of studies undertaken during the summer by members of the commission, the Army Medical Department, the Communicable Disease Center, and the National Institute of Allergy and Infectious Diseases was designed to determine the effective dose of Asian antigen. Only those experiments bearing on three specific points will be mentioned. One is concerned with the level of antibody which developed in patients convalescent from Asian influenza. Another deals with the amount of viral antigen required to elicit a similar level of antibody in a vaccinated person. A third point is concerned with the level of antibody found in volunteers who were resistant to experimental challenge with Asian virus.

If some license is permitted in interpreting data of others, it may be stated that levels of hemagglutination inhibition antibodies of the order of a titer of 1:32 actual dilution of serum (or 1:128 final dilution of serum) were present in convalescent serums (3). Moreover, to induce a similar level in about 90 percent of persons inoculated with a single dose of vaccine given subcutaneously, 400-500 CCA units of

antigen were required (7), according to Keith E. Jensen of the Communicable Disease Center. Finally, appreciable resistance to challenge was displayed by those volunteers who had antibody levels of the order of 1:32. (In the tests of Bell and associates (7), 78 percent of the placebo controls developed signs of illness following challenge; 60 percent of vaccinated persons who failed to acquire detectable antibodies became ill; 43 percent of those with titers of 1:10 to 1:20 developed influenza; while only 25 percent of those who had titers of 1:40 or greater became ill.)

Such information as this, coupled with knowledge of the improved yields of virus from infected eggs and the increased facilities of the manufacturers, led to a recommendation in October that the potency of monovalent Asian influenza vaccine "be increased from 200 CCA units to 400 CCA units per milliliter as soon as feasible and not later than December 1, 1957" (6b). Current recommendations for the use of the vaccine appear on p. 130.

October 1957 saw the shift to the production of 400 CCA unit vaccine. Indeed, by November 1, two manufacturers had submitted to the Division of Biologics Standards for concurrent testing 13 lots with the 400 CCA unitage. As of November 12, 2 million ml. of 400 unit vaccine had been released by the division; 13 million ml. was available by December 12.

The report of Dr. Fred Davenport which appears in this issue (pp. 133-139) presents the available field information dealing with efficacy of Asian vaccine among military populations. In general, the data provide grounds for encouragement.

For many years, the influenza vaccines used in civilian and military populations have been of the polyvalent type, containing several strains of influenza A virus and one or more strains of influenza B virus. The formula for a polyvalent material which is now being produced for use during the latter part of the winter is as follows: influenza A, Asian strain—200 CCA; influenza A', PR 301 strain—100 CCA; influenza A, PR 8 strain—100 CCA; and influenza B, Great Lakes strain—100 CCA. The recommended basic course of immunization consists of 2 subcutaneous injections each

By mid-May the Department recognized that the virus was antigenically dissimilar from other influenza A viruses and that the American population was virtually without protective antibodies against the new strain (3). Simultaneously, investigators in other countries made comparable observations. Numerous other investigators in university, governmental, and industrial laboratories in the United States began their studies on the Asian virus during the last week of May. In the meantime, WHO influenza detection centers throughout Asia, the Western Pacific, Australia, and the Middle East noted and reported the rapid spread of influenza from Hong Kong. It soon became apparent that the new virus was highly contagious, provoking large epidemics affecting up to 20 percent of the general population in one area after another, and in certain selected groups involving 60-70 percent of the population. Fortunately, the mortality remained low as the disease continued its sweep (4).

As a result of intensive work in the commercial laboratories, the first experimental lots of Asian monovalent vaccine were available before mid-June and were promptly placed under assay in volunteers by personnel of the Commission on Influenza, the Army, and the Public Health Service. It is worth noting that the first cases of Asian influenza were diagnosed in the continental United States during the first week of June (5a).

The military services, during the latter part of June, provided a most important stimulus to the commercial production of vaccine by inviting bids for 2,650,000 ml. of monovalent Asian vaccine. At about the same time, the Surgeon General of the Public Health Service informed the manufacturers that he anticipated the need for large amounts of influenza vaccine for use by the civilian population during the coming fall and winter. With these demonstrations of active interest in a vaccine prepared against the newly isolated Asian influenza virus, the manufacturers that had produced influenza vaccine in previous years offered to make a strenuous effort to meet the demands created by the anticipated epidemic. These manufacturers undertook this commitment, which involved considerable financial risk, without government subsidy.

Vaccine Dosages

The Public Health Service recommends the following dosages of Asian influenza vaccine:

For those who have not been vaccinated, subcutaneous injection of 1.0 cc. of the 400 CCA unit strength Asian influenza vaccine currently being produced.

For those who have received 0.1 cc. intracutaneously or 1.0 cc. subcutaneously of the 200 CCA unit vaccine previously produced and for those individuals at special risk (pregnant women, older persons, and those with chronic respiratory or cardiac disease), a second 1.0 cc. subcutaneous injection of 200 CCA vaccine is recommended. Physicians may also wish to recommend a second injection for other patients. If the 400 CCA unit strength vaccine is available, 0.5 cc. should be given. The second dose should be received not less than 2 weeks after the first.

For children, the recommendation of the American Academy of Pediatrics is: For children under 5 years of age, 0.1 cc. intracutaneously or subcutaneously, repeated after 1 to 2 weeks; for children from 5 to 12 years of age, 0.5 cc. subcutaneously, repeated after an interval of 1 to 2 weeks; for children over age 13, the adult dosage.

The summer months were devoted to solving technical problems such as (a) increasing the yield of virus growing in embryonated eggs, (b) developing methods for assaying potency which would circumvent the time-consuming procedures previously employed, (c) determining the immunogenicity of the vaccine in man, (d) training new technical teams in the pharmaceutical houses and renovating old facilities or constructing new, and (e) arranging for unprecedented quantities of fertile hens' eggs.

By mid-August, two manufacturers had produced a total of 500,000 ml. of monovalent Asian vaccine and obtained its release by the Division of Biologics Standards of the Public Health Service. Progress thereafter was rapid. Before the end of the first week in September, each of the six companies manufacturing the vaccine had produced one or more lots

Role of the Commission on Influenza

FRED M. DAVENPORT, M.D.

SINCE 1940 the Commission on Influenza of the Armed Forces Epidemiological Board has been continuously engaged in investigations of influenza and has given special attention to the development of an effective method for prevention of this disease. The results of controlled field trials in 1943 and 1945 convincingly demonstrated the effectiveness of vaccination against influenza A and influenza B. Vaccination studies in 1947 showed with equal authority that vaccines of limited antigenic coverage were ineffective against the A' variants prevalent that year and gave an unequivocal answer to the question, Are antigenic differences detected by laboratory methods of practical importance for immunization?

Despite the difficulty of conducting field trials in years of low influenza incidence, the results of studies carried out between 1949 and the spring of 1957 clearly demonstrated how to cope with the phenomenon of sudden major antigenic shifting. Vaccines containing the A' variant were repeatedly shown to be effective against influenza A' (1). During this period few studies on vaccine effectiveness were carried out under auspices other than those of the Commission on Influenza.

The vaccine trials have been only one of the commission's major functions. A chain of laboratories was established in 1942. These are

still maintained to serve as listening posts for the early detection of influenza, to document its spread, and to provide virus samples to a central strain study center for antigenic analysis. This system has been continuously productive of valuable epidemiological information. For example, in 1943 scattered local outbreaks of influenza A were identified in the spring and early summer before the extensive epidemic began in November of that year. In 1945, when the system was extended to include observations in most of the areas where the U. S. Army was engaged, a series of small outbreaks of influenza B, extending from March to the epidemic buildup in November and December, was traced in the United States and Alaska, in the Pacific and Caribbean theaters, and in Australia and South America. These observations revealed a year-long widespread prevalence of influenza B with a sharp fall and winter epidemic peak. The Army laboratories, and later the World Health Organization, have continued and expanded this activity into a vast network so that by now the point-to-point spread of influenza can be rapidly and accurately followed, and the data can be viewed in historical perspective. The summer occurrence of Asian influenza was therefore not a new finding and in itself did not herald catastrophe.

Development of Influenza Vaccines

In addition to the laboratory observations, since 1942 studies made by the Commission on Influenza of the dimensions of antigenic variation of influenza viruses and their significance for immunity induced by vaccination or acquired by repeated infection have led to the recognition that the common antigenic components of influenza viruses provide a degree of cross resistance. The objective for prevention

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of 1.0 ml., the second following the first by not less than 2 weeks.

Future

While the record to date for developing and producing Asian vaccine has been truly amazing, it would be foolhardy to assume that it will be possible to do as well or better the next time the country is confronted with a severe epidemic caused by an unfamiliar strain of influenza virus. There was an interval of almost 6 months between the time the first strain of Asian virus reached a research laboratory in the United States and the time at which the weekly pneumonia and influenza deaths increased above the "epidemic threshold" in the 108 cities which are under surveillance by the Communicable Disease Center (5b).

Suppose the next widespread occurrence of influenza begins in North America or arrives here promptly and reaches epidemic proportions within a month or so? The measures which were successful in this epidemic did not provide any useful quantity of vaccine during the first 2 months after the virus seed reached the manufacturers. I think it is obvious that the search must continue for means of rapidly increasing the resistance of populations to epidemic influenza.

Recognition of this fact was one of the reasons the Surgeon General of the Public Health

Service, on the recommendation of the Association of State and Territorial Health Officers, established an Advisory Committee on Influenza Research. This committee was asked, among other things, to consider and advise the Surgeon General on what further research might be undertaken to strengthen influenza control in the future and to suggest where such research might most profitably be done.

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Vaccines, 1919

"The only way in which we are to secure promptly acceptable evidence of the value of a bacterial vaccine is by the vaccination of only a portion of the individuals in a large group, holding the remainder as controls; age, sex, and conditions of exposure being the same in the two groups.

"On the other hand, a vaccine should not be condemned unless controlled as just indicated, and unless it has failed to show protec-

tive value when sufficient time has elapsed after the inoculation to make it reasonably likely that any immunity which may develop will have had an opportunity to do so.

"A large number of vaccines have been used, some made from the influenza bacillus alone, others from this in conjunction with pneumococci, staphylococci, and streptococci, and in various combinations; the failure of one does not necessarily mean the uselessness of others."

—G. W. McCoy, Director, Hygienic Laboratory, Public Health Service,
Public Health Reports, May 30, 1919.

The number of deaths from pneumonia occurring after influenza increased dramatically, but neither the case fatality rate nor the age distribution of pneumonia patients was different from other years—again there was no evidence of increased virulence of Asian influenza. There was just much more influenza, many more pneumonias, and hence a greater number of fatal cases of these diseases. In a careful study of about 50 fatal cases, it was found that approximately one-half showed evidence of staphylococcal pneumonia, while death in the remainder could largely be attributed either to overwhelming infection by organisms readily responding to early conventional treatment or to less intense infections in persons who had chronic disease involving vital organs. A small proportion of fatal cases were associated with infection in the last trimester of pregnancy. In a small number of cases the cause of death was recorded as hemorrhagic pneumonia, apparently without detectable secondary bacterial invasion. However, it was stressed that the pneumonia cases generally responded well to antibiotics.

The results of these field investigations were reported to the Surgeons General of the three armed services and to the Surgeon General of the Public Health Service. These reports served as timely and precise information to dispel rumor, to establish the pattern of the behavior of Asian influenza, and to forecast what might be encountered in the United States during the fall and winter of 1957-58.

Virus Strains of Asian Influenza

As time permitted, the question of the antigenic relationship of Asian strains to strains prevalent in former years was explored by studies carried out in the virus laboratory of the University of Michigan's School of Public Health at Ann Arbor. The information gained from the field trips and from other sources indicated that Asian influenza followed the familiar pattern of incidence by age outlined in former reports on the attack rate of influenza caused by strains similar to those of swine influenza (1918), by A strains (1943), and by A' strains prevalent since 1947. The incidence of Asian influenza was highest in childhood and progressively lower in older age groups. The

most plausible thesis yet presented to explain this phenomenon is that relative immunity in older persons is conferred not by highly strain-specific antibody but by a composite of antibodies built up by repeated exposure to other antigenic variants of influenza A (2). In consequence, then, persons having a composite antibody have a broad immunity to influenza even though their serums may show by conventional methods little or no hemagglutination inhibition (HI) antibody against the prevailing virus. To develop a composite antibody and a broad immunity by vaccination with several selected strains of virus has become one of the goals of the Commission on Influenza. It was important, therefore, to discover whether the relative resistance of older persons to Asian influenza could be correlated with detectable antibody.

The first significant report on the demonstration of antibody in the serums of normal humans came through Dr. Mulder from Leiden, Holland, who found respectable concentrations of antibody against Asian virus in the serums of a small proportion of persons 70-80 or more years of age (personal communication). This finding was promptly confirmed in Ann Arbor and elsewhere with serums obtained locally and, subsequently, with serums received from Dr. Mulder. Moreover, at Ann Arbor it was shown with pools of serums collected by 2-year age intervals that antibody detectable by complement fixation with Asian virus antigen was not present in persons below the age of 30 years but was usually present at low levels in those above 30. In addition, by hemagglutination inhibition, using special treatment of serums and antigen, low levels of antibody were frequently found at ages corresponding to those at which high levels of A', A, and swine influenza virus antibodies are regularly present. There could be no doubt, then, that Asian virus was, antigenically speaking, not a completely "new acquaintance."

This opinion was confirmed by observing the antibody response of four age groups to Asian virus vaccine given as 250 CCA units in 1 ml. subcutaneously (table 1). For this presentation, antibody levels are expressed as the geometric mean value of the groups studied, using final dilutions of serums for the calculations.

of influenza by vaccination has become the development of a vaccine of broad effectiveness containing representative strains of the major antigenic families of influenza viruses (2). It was natural then for the commission to be deeply interested and involved when Dr. Maurice R. Hilleman, then chief of the Respiratory Disease Division, Walter Reed Army Institute of Research, reported that another major antigenic shift had occurred and that the new viruses were responsible for the severe epidemics reported from the Orient in April and May of 1957 (3). Promptly, a number of steps were taken by the commission to assess the significance of these events.

On the basis of the first epidemiological and immunological information available, it seemed quite unlikely that vaccines used in former years would provide optimal protection against Asian influenza. In a series of conferences held first with military and later with civilian health authorities, a program was developed for primary immunization against the new antigenic variant, using monovalent vaccines of the highest potency obtainable—at that time 200 chicken cell agglutination (CCA) units—to be followed in the military after a suitable interval by a booster dose of polyvalent vaccine containing the old as well as the new strains. The negotiations and the placing of a large order for vaccine by the military gave an essential impetus to vaccine production. Later, as part of the unprecedented effort directed by the Public Health Service in preparation for the current epidemic of Asian influenza in the civilian population, production of influenza vaccine was greatly expanded. Plans for effective use of vaccine were formulated, and successful methods were put into operation to maintain detailed surveillance of the spread and character of the influenza epidemic. These important developments comprise the most vigorous effort ever made to protect a population against influenza—the last great plague of mankind.

Influenza Surveys

In keeping with the traditions of the Armed Forces Epidemiological Board and its commissions, I made a reconnaissance early in June in Australia, the Philippines, Japan, and the

Hawaiian Islands to gain first-hand information from virologists, clinicians, and military and public health agencies about the impact of Asian influenza in these areas. At that time, when rumor was rife but facts were difficult to acquire, it was found that the disease was widespread although clinically mild. The influence of crowding on the incidence of Asian influenza was quite apparent. The influenza attack rate in Navy personnel stationed on ships was clearly higher than in those based on shore, who, like the personnel of the Army and the Air Force, had the benefit of a larger number of cubic feet of air space per man. The incidence of influenza was obviously higher in the lower socioeconomic groups of the countries visited, those groups who lived in closer proximity to each other than did their more fortunate neighbors. Moreover, it was learned that Australia had been seeded with influenza early in its winter season; yet no catastrophic epidemic had resulted. The influence, then, of cultural factors on the severity of epidemic influenza was again shown.

The fatalities in the Orient, reported in the press without appraisal, were found to be concentrated in the very young and in the old-age groups. Moreover, the attack rate by age followed the familiar pattern, being highest in childhood and becoming progressively lower thereafter. Finally, considering the number of deaths reported and taking into account the number of persons ill, it was apparent that Asian influenza was not a particularly virulent form of infection. It was reassuring to learn that, despite an attack rate of about 30 percent, there had been no disruption of essential activities in either civilian or military communities.

Later, in August 1957, a field study was established in Santiago, Chile, to observe the effects of Asian influenza in a country which ordinarily has a high incidence of pneumonia during its winter season. Dr. Harold B. Houser was the field director of this special study group, and the members were selected from personnel of the Commission on Influenza, the Commission on Acute Respiratory Disease, and the Commission on Streptococcal Diseases, Armed Forces Epidemiological Board. Chilean investigators collaborated most effectively in this effort.

Serums were collected before and 2 weeks after subcutaneous vaccination with 1 ml. of vaccine. Clearly, the frequency of antibody increase and the amount of antibody stimulated by vaccine of 100 to 250 CCA units were irregular and of low order. These poor results are like those observed in former studies when strains of influenza virus were given to persons who had not previously been exposed to these strains (4). With vaccines of 400 CCA units and above, antibody increase was more uniform and the postvaccination levels were, in general, higher. These levels approach those found in the earliest successful field trials of vaccination carried out by the Commission on Influenza but are lower than the levels observed in recent years with vaccines of higher potency. The data also imply that doubling the dose of virus from 400 to 800 CCA units does not commensurately increase the frequency or amount of antibody increase. Several members of the commission supervised the administration of most of these vaccines, collected the serums, and shipped them to the virus laboratory at Ann Arbor so that comparisons could be made under uniform conditions. The data were available by late August

1957 and were widely circulated. They supply one basis for the recent increase in potency of monovalent vaccine from 200 to 400 CCA units per dose.

Effectiveness of Asian Influenza Vaccines

The Commission on Influenza has now obtained the first specific information regarding the effectiveness of vaccines of varied potency against the current epidemic of Asian influenza. They indicate that protection is increased as the dose of virus is increased.

The studies summarized in table 2 were begun as soon as influenza vaccines of desired potency could be obtained in sufficient quantity. On July 26, 1957, Dr. J. O. Culver and Dr. Edwin H. Lennette began to inoculate 40 percent of the recruits newly assigned to training companies at Fort Ord, Calif., with monovalent Asian influenza virus vaccine containing 250 CCA units per milliliter. One milliliter of vaccine was given subcutaneously in this and in the following studies. Sixty percent of the men in each company received a placebo injection of formalinized saline. At the time the

Table 2. Clinical efficacy of vaccines containing Asian strains of influenza virus

| Investigators | Vaccine ¹ | Vaccinated | | | Controls | | | Estimated effectiveness (percent) |
|---|---------------------------------------|-----------------|---|----------------|------------------|---|----------------|-----------------------------------|
| | | Number recruits | Cases of respiratory disease ² | | Number recruits | Cases of respiratory disease ² | | |
| | | | Number | Rate per 1,000 | | Number | Rate per 1,000 | |
| Culver and Lennette, Fort Ord, Calif. Meiklejohn and associates, Lowry Air Force Base, Colo. | 250 CCA units, monovalent. | 916 | 20 | 21.8 | 1,448 | 55 | 37.9 | 42 |
| | 200 CCA units, monovalent. | 775 | 46 | 59.3 | 806 | 121 | 150.1 | 61 |
| | 400 CCA units, monovalent. | 649 | 12 | 17.3 | 624 | 27 | 52.5 | 67 |
| | Polyvalent with 400 CCA units, Asian. | 564 | 9 | | ³ 614 | 38 | | |
| Rose and associates, Fort Dix, N. J. | 200 CCA units, monovalent. | 1,869 | 62 | 33.2 | 1,665 | 126 | 76.1 | 57 |
| | 750 CCA units, monovalent. | 1,665 | 29 | 17.4 | | | | 77 |
| Gundelfinger and associates, Great Lakes Naval Training Center, Ill. | 200 CCA units, monovalent. | 1,080 | 43 | 39.8 | 1,444 | 234 | 162.0 | 75 |
| | Polyvalent without Asian strain. | 1,031 | 95 | 92.1 | | | | 43 |

¹ CCA = chicken cell agglutination.

² Predominantly influenza, not serologically identified.

³ Type B influenza vaccine.

Table 1. Relation of age to antibody response after vaccination with 250 chicken cell agglutination units of Asian influenza virus

| Age group | Titer | Frequency of antibody rise ¹ |
|----------------------------------|-------------------|---|
| Children..... | ² < 32 | 3/25 |
| Recruits..... | < 32 | 2/23 |
| Middle-aged persons..... | 32 | 11/25 |
| Persons over 80 years of age.... | 281.6 | 11/14 |

¹ Numerator—number of persons showing antibody increase even when an increase was found only in the next highest dilution of serums; denominator—number of persons studied.

² Geometric mean postvaccination hemagglutination inhibition antibody titers. Prevacination titers were less than 32.

Children and military recruits showed no antibody increase as measured with the ferret-mouse-egg line of Japan 305 strain; middle-aged adults showed as a group antibody increase from less than 32 to 32. Eleven of the twenty-five subjects studied showed some antibody increase. However, in a group of 14 persons 80 or more years of age, antibody rose after administration of the same vaccine from less than 32 to 281.6, and 11 of the 14 subjects showed antibody rise. Four of fifteen other senior citizens showed a rise in influenza antibody when vaccinated with older strains.

In contradistinction to earlier explanations by other investigators, the accumulating epidemiological and immunological data strongly indicate that the high attack rate and ease of spread of Asian influenza do not reflect a total lack of immunity in the population. Rather, the data suggest that the capacity for rapid spread at high attack rates may be unrelated to the antigenic structure of the prevailing virus. This was certainly true when the A' strains emerged in 1946-47.

From the serologic findings in the current experience, correlations can be made between the resistance of very old persons to influenza and the presence of antibody that reacts with strains of Asian influenza. Dr. Mulder first suggested that the virus involved in the pandemic of 1890 was closely related to Asian strains, and our findings lend support to his hypothesis. More importantly, they suggest that antigenic variation among influenza vi-

rus has finite limits and that antigens formerly prominent are bound to be repeated as major antigenic components. This view supports the concept that ultimately a polyvalent composite vaccine can be given which will induce a broad immunity against influenza, an immunity that will no longer be jeopardized by sudden and unexpected antigenic shifting. The alternative is to pursue endlessly the futile course of trying with present methods to prepare a monovalent specific vaccine each spring to combat the unknown strain of influenza virus anticipated for the fall.

The Commission on Influenza was also concerned with defining the antibody response of humans to monovalent vaccines containing Asian virus because past experience had indicated that, while vaccination with the new strain was desirable for optimal protection, one could expect that antibody response and hence protection would not be optimal using the 200 CCA dose that was made the standard early in the summer. In brief, it seemed unlikely that an antigenic change in the strain would necessarily change immunological principles. Hence, owing to the increased yield of virus in eggs, as soon as vaccines could be prepared at higher unitage, studies were aimed at defining the dose-antibody response relationship in man to the virus of Asian influenza. The results of tests using vaccines prepared by 3 different pharmaceutical concerns by 3 different methods of manufacture are tabulated below.

| Titer, by virus dose (units) | Frequency of antibody rise ¹ |
|------------------------------|---|
| 100 CCA | |
| 25 G ² | 11/21 |
| <32..... | 0/22 |
| 200 CCA | |
| 28 S..... | 14/21 |
| 23 O..... | 4/23 |
| 51 2..... | 11/21 |
| 29 4..... | 16/25 |
| 400 CCA | |
| 83 2..... | 18/20 |
| 35 2..... | 16/21 |
| 750-800 CCA | |
| 83 2..... | 19/21 |
| 74.2..... | 25/25 |

^{1,2} See footnotes 1 and 2 to table 1.

NOTE CCA=chicken cell agglutination.

Comdr. B. F. Gundelfinger, Jr. Vaccination of recruits was carried out on August 10, 1957, using two vaccines and a control material. The first vaccine contained 200 CCA units per milliliter of Japan 305 strain of influenza virus. The second vaccine, the Armed Forces 1956-57 polyvalent influenza vaccine, did not contain an Asian strain. This vaccine was composed of 250 CCA units each of swine, FM1, and Great Lakes strains. Thirty percent of the study population received monovalent vaccine, 30 percent received polyvalent vaccine, and 40 percent received placebo. Illness clinically diagnosed as influenza appeared at Great Lakes in epidemic proportions during the week ending October 5 and continued through the week ending October 19. In fact, the admission rate for the week ending October 12 was higher than the admission rate for any week during the past 8 years.

The average admission rate of recruits for the 3 weeks was 162.0 per 1,000 in the placebo-inoculated group, 39.8 in the group receiving monovalent Asian virus vaccine, and 92.1 in the group receiving 1956-57 polyvalent vaccine. In this short interval the effectiveness of the monovalent vaccine was approximately 75 percent and of the 1956-57 polyvalent vaccine about 43 percent. If the apparent protective effect of the polyvalent vaccine is substantiated when the studies are completed, this information will add to the data now at hand demonstrating important antigenic relationships between the Asian strains and other strains of influenza virus isolated in former years. This result encourages the outlook for a practical composite vaccine of broad coverage.

Although the studies reported in table 2 are incomplete, the trends shown are sufficiently distinct to indicate the final effects of vaccination with vaccines of various potencies. These effects should be increased when laboratory studies identify and remove from the study cases of illness caused by other respiratory disease agents which are so common in recruits. Results of the studies emphasize, too, that vaccine of 200 CCA units gives somewhat less than optimal results, but that the effectiveness of vaccination can be increased by giving higher doses of virus.

Summary

This brief account of the role of the Commission on Influenza of the Armed Forces Epidemiological Board in studies of the epidemiology and prevention of influenza outlines the accomplishments of a group which has been working continuously and closely with the military since 1940 in the study of influenza as a disease problem. Largely by the efforts of this commission, the effectiveness of vaccination as a practical measure in preventing influenza has been firmly established, and the results of the commission's studies have given direction to the present effort to minimize the effects of epidemic Asian influenza.

Field studies conducted outside the United States on the incidence of Asian influenza in different age groups clearly showed the relative immunity of the older segments of the population to this disease. Laboratory studies carried out in Ann Arbor, Mich., and elsewhere have begun more clearly to define the antigenic relationships of current strains of influenza virus to older viruses and to demonstrate the antibody foundation of the relative immunity of the older age group. Field studies abroad also provided clinical, virologic, bacteriological, and pathological information on Asian influenza and its complications.

Finally, the results of the vaccine trials have provided the first specific evidence of clinical effectiveness of vaccine against the current epidemic of Asian influenza and have shown the value of increased dosages in providing more optimal protection against this disease.

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study was begun, Asian influenza was already prevalent at Fort Ord, and most of the patients with respiratory illness could not be admitted to the station hospital. Therefore, the effectiveness of the vaccine was measured by comparing the rate of dispensary visits for respiratory disease observed in the vaccinated and the rate in the unvaccinated populations. Cases of influenza occurring within 10 days after administration of vaccine or placebo were not considered in the evaluation because influenza was prevalent on the post at the time of vaccinating the recruits, and significant antibody increase would not be expected until 10 days after vaccination. For the period August 5-26 a rate of 21.8 cases of influenza per 1,000 recruits was found in the vaccinated group and a rate of 37.9 per 1,000 in the unvaccinated group, an estimated effectiveness of 42 percent.

At Lowry Air Force Base, Colo., Dr. Gordon Meiklejohn and his associates began their studies on July 29, 1957. Within 2 days, 775 airmen had received monovalent vaccine containing 200 CCA units per milliliter of an Asian strain of influenza isolated in Formosa. A placebo injection of formalinized saline was given to 806 airmen. The preparations were alternated within military units so that approximately 50 percent of the persons in each unit received virus vaccine and 50 percent, control material.

On September 23, a second study was established using three different influenza virus vaccines and a placebo preparation. In this study, 25 percent of the members of each unit received one of the following: (a) monovalent vaccine containing 400 CCA units of Japan 305 strain, (b) polyvalent vaccine containing 400 CCA units of Japan 305, 200 CCA units each of swine (A-1931) and Great Lakes (B-1954), and 100 CCA units each of PR 8 (A-1934) and PR 301 (A'-1954), (c) influenza B vaccine containing 400 CCA units of the Great Lakes strain of 1954, or (d) formalinized saline. About 600 persons received each preparation. The concentration of Asian virus in these vaccines is probably higher than in the vaccines used at Fort Ord, since independent measurements have indicated that the commercial laboratory which, upon request, prepared the vaccine for Lowry Air Force Base usually

underestimated the virus content of their product.

At the end of July, when vaccination was initially carried out at Lowry Air Force Base, there was no evidence of the presence of influenza, but the disease appeared in the third week of September. Dr. Meiklejohn and his associates have analyzed the admissions to the hospital for acute respiratory disease from September 16 to October 27 for those vaccinated with 200 CCA units of an Asian strain of influenza virus and for the control group. The approximate protective effect was 61 percent. In the second study, no significant differences in the occurrence of respiratory infections were observed between the groups inoculated on September 23 during the first 10 days after vaccination. However, in the subsequent period the approximate protective effect of vaccines containing 400 CCA units of Asian virus appears to be 67 percent. Note the apparent increased effectiveness of the more potent vaccines containing 400 CCA units (table 2).

At Fort Dix, N. J., Dr. Harry Rose and his associates began vaccination of recruits on August 1, 1957, using two different vaccines. One contained 200 CCA units of Japan 305 strain per milliliter and the other, 750 CCA units. Companies of recruits arriving at Fort Dix were divided into thirds by roster, and each group received either 200 CCA units of virus, 750 CCA units of virus, or formalinized saline. The vaccination program was completed on September 6. A sharp outbreak of Asian influenza occurred at the end of September. Dr. Rose has tabulated the hospital admission rates for respiratory disease in each vaccine group from September 29 through October 20. The rate per 1,000 in the control group was 76.1; in those receiving vaccine containing 200 CCA units, 33.2; and in those receiving 750 CCA units, 17.4. The estimated effectiveness of the 200 unit vaccine was 57 percent and of the 750 unit vaccine, 77 percent. In this study, as in Dr. Meiklejohn's, the increased effectiveness of higher doses of virus for vaccination is clearly shown.

The Surgeon General of the U. S. Navy has provided information about the results of studies carried out at Great Lakes Naval Training Center, Ill., under the direction of Lt.

Laboratory Support Program

The pattern of providing financial and other types of assistance to laboratories, principally those of official health agencies, as later discussed, had been established earlier in the poliomyelitis diagnostic field. Anticipating a need for specific diagnosis of influenza, in order that accurate estimates of attack rates could be obtained, a basically similar program was planned by the Communicable Disease Center. This as executed consists of reimbursing official health agency laboratories for contractual services, which include establishing and maintaining facilities for isolating and typing influenza virus, maintaining serologic procedures, and reporting results of laboratory study of cases to the Center.

Certain academic or institutional laboratories have essentially similar types of contracts to provide this service to States, or to serve in a resource capacity in the evaluation of materials, procedures, or skills.

The facilities thus established are intended to perform functions expected to provide better intelligence on influenza than might otherwise be expected. The services of the laboratories will include examination of clinical materials from index cases of respiratory diseases in order that local influenza outbreaks may be early recognized. Since much influenza-like disease is prevalent, the workload involved in the early detection of influenza has been substantial. Additionally, the laboratories participating in the program are directing special efforts toward obtaining isolates, either viral or bacterial, from persons with severe influenza infections, and similar material from fatal cases that come to autopsy. All cooperating laboratories are participating in a technical evaluation of procedures and skills so that appraisal of the value of the different diagnostic techniques can be made and so that some estimate of the range in results of tests in the various laboratories can be determined.

Earlier Observations

Variations among type A influenza viruses have been studied for many years but significant antigenic differences and relationships have been most clearly demonstrated by field trials of vaccine. In the laboratory, results of

antigenic comparisons of the different strains with cross-tests utilizing various antisera have provided detailed information about shared antigenic components. It has also been possible to show that periods of prevalence for virus strains with particular major antigens are reflected in patterns of antibody titers in human sera from various age groups. These developments have been reviewed elsewhere (4). It was evident from these past studies that a new set of type A variants of the influenza virus could be expected.

One of the lessons learned during the past 15 years was that influenza vaccines could be relied upon to be effective in reducing the incidence of the disease only when the vaccine formula included strains representative of the prevalent set of viruses. Recognizing this, the World Health Organization established strain study centers with many strategically located surveillance laboratories with the view toward rapid identification of virus isolates from each new outbreak. The viruses thus obtained in Singapore, Formosa, and Japan during May 1957 were strikingly different from previous type A strains. The incidence of antibody against these viruses in human sera was extremely low. The expected new set of viruses had appeared and promised to spread uninhibited throughout the world population. Anticipating this, the WHO program participants and responsible military and Public Health Service officials were alerted, and within a week prototype strains were sent to vaccine manufacturers for pilot studies and to the collaborating laboratories so that each could become familiar with the characteristics of the new agent.

Diagnostic Reagent Program

Although many laboratories are capable of preparing the antigens and antisera necessary for the diagnosis of influenza infections, a majority rely upon a central source for these materials. Since it was realized that early detection of influenza would depend upon the general availability of these reagents, in June 1957 approximately 100 laboratories were sent 15 ml. each of viral antigen prepared with the A/Jap/305/57, the A/Denver/1/57, and the B/GL/1739/54 strains. The last two strains are representative of recent variants of types

Laboratory Diagnosis of Asian Influenza

KEITH E. JENSEN, Ph.D., and RALPH B. HOGAN, M.D.

MODERN STUDIES of influenza are dependent upon information obtained in the laboratory. Clinical impressions and epidemiological observations may suggest influenza. But until virus isolation or antigenic experience has been demonstrated, an etiological diagnosis cannot be made since many other agents can produce an influenza-like syndrome (1).

The role of the laboratory in defining and following the spread of an infectious agent has never been more dramatically shown than in the present epidemic of Asian influenza. From the time of the earliest antigenic analyses (2, 3) it was predicted that this new variant of the influenza virus would spread rapidly and that epidemics would occur throughout the world. It is the purpose of this report to describe the laboratory facilities which are now engaged in a large-scale operation aimed at providing definitive information about influenza. Some of the results obtained during these activities will also be presented.

Laboratory Network

The Laboratory Branch of the Communicable Disease Center, Public Health Service, began to intensify its work with influenza in 1955, and at that time, the Virus and Rickettsia Section accepted responsibility for an influenza center of the World Health Organization. In 1956, the CDC Virus and Rickettsia Section established a Respiratory

Disease Unit at Montgomery, Ala., which was concerned with studies of influenza and several other viruses from the respiratory tract. This unit was designated by the World Health Organization to be the International Influenza Center for the Americas. In February 1957 this center sponsored travel for its director to the World Influenza Center in London for an exchange of concepts and discussions of problems.

The WHO influenza program consists of a worldwide network of collaborating laboratories and observers that report to the centers concerning the occurrence of influenza and forward virus isolates for antigenic analyses. This program was initiated in the United States in 1948 with approximately 40 laboratories participating.

Several State and Territorial health department laboratories have collaborated with the program during the past 9 years, and in the past few months, with help from CDC, many more of these laboratories have been able to participate in the program. There are now 45 health departments actively supporting the Public Health Service and WHO investigative projects. Currently a total of 135 laboratories are members of the American network. In the United States many of these are located at universities, institutes, and medically oriented organizations as shown below.

| | |
|---|-----|
| United States..... | 115 |
| State and Territorial health departments..... | 15 |
| Universities..... | 39 |
| Institutes..... | 11 |
| Hospitals..... | 8 |
| Municipal..... | 6 |
| Armed Forces..... | 3 |
| Drug companies..... | 3 |
| Canada..... | 3 |
| Central America..... | 1 |
| South America..... | 13 |

The authors are with the Laboratory Branch of the Public Health Service's Communicable Disease Center. Dr. Jensen is chief, Respiratory Disease Unit, Virus and Rickettsia Section, Montgomery, Ala., and Dr. Hogan is chief, Laboratory Branch, Chamblee, Ga.

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A and B. Antiserums prepared in chickens with each of these viruses were also distributed to laboratories in 5.0-ml. volumes. By the end of October, more than 30,000 ml. of antigen and 10,000 ml. of antiserum had been mailed to more than 300 laboratories.

Results of tests in July made it clear that the antigen prepared with the Japan 305 strain transferred serially in embryonated eggs was useful only in complement fixation (CF) tests and not in the hemagglutination inhibition (HI) method. Serum from patients convalescent from Asian influenza did not readily inhibit the hemagglutination of chicken erythrocytes by this virus. Meanwhile the virus had been instilled into the respiratory tract of ferrets, causing death, and infective suspensions of the lung were transferred serially in mice and later in eggs. This "animal-line" virus was much more sensitive to antibody in HI tests. Although mechanisms concerned in converting influenza strains from an antibody-insensitive phase to the more reactive phase are not understood, the phenomenon is well known and has been witnessed in many laboratories.

Another technical matter had to be dealt with, however, before the animal-transferred line of virus could be utilized. In addition to becoming more reactive with antibody, this line was also inhibited to a high degree by nonantibody substances in human and animal serums. The nonspecific inhibitors could not be digested with trypsin, but overnight treatment with solutions of periodate completely destroyed the troublesome inhibitors without markedly reducing specific antibody titers.

Therefore, beginning in August the antigen supplied to laboratories for the detection of Asian influenza antibody response has been that prepared with the egg-ferret-mouse-egg line (EFME). Directions for use of the antigen have been supplied. The viable seed for this Japan 305 variant and the other strains have also been distributed, and other materials, including human serums and normal allantoic fluids for control purposes, have been furnished upon request.

Information and Training Activities

Training in laboratory techniques in use at the International Influenza Center was pro-

vided in a 2-day workshop at the end of September. A class of 62 State and Federal technicians and directors was instructed in procedures to be followed in the isolation of influenza viruses from suspected materials. Standard methods for performance of the CF and HI tests were discussed and incorporated in laboratory exercises. Techniques for production of diagnostic reagents were outlined and considerable time was spent in discussing the interpretations of data.

The International Influenza Center met the problem of communicating pertinent recent information, or methodology, to laboratories by periodic newsletters and by collaboration with the CDC Influenza Surveillance Unit in the publication of a weekly influenza report.

Characteristics of Virus Isolates

The nature of this report does not allow a detailed description of observations made about the viruses isolated in the past few months. However, the following statements may serve to summarize the findings:

- All type A isolates obtained from various parts of the world since June are closely related antigenically to those sent from Singapore. The Asian set apparently has replaced the A' or FM family. Approximately 200 type A viruses have been forwarded to the International Influenza Center during this time, and all have been readily typed as the Asian variety. Three type B strains have been received, and these are very similar to the B/GL/54 strain contained in polyvalent influenza vaccines.

- The rate of successful virus isolations has been extremely variable (from 0 to 100 percent) and is obviously dependent upon several pre-laboratory factors, such as care taken in selection of patients, procedures followed in specimen collection, and transfer of specimens to the laboratories. In the laboratory, proper storage and treatment of specimens are necessary. Although the amniotic inoculation of 11-day embryonated eggs continues as the method of choice, many investigators have found monkey kidney culture useful (5). It is clear that amniotic fluids harvested from eggs should be tested with suspensions of guinea pig erythrocytes to detect the presence of hemagglutinating

virus. Often fluids shown to be negative with chicken erythrocytes were definitely positive with cells from guinea pigs. The value of sub-inoculating negative pools of amniotic fluids into another group of eggs has also been demonstrated. In several laboratories over 50 percent of the successful isolations were noted in this manner.

• Many of the positive fluids contained only low concentrations of hemagglutinating virus so that from 2 to 4 additional transfers were necessary before good titers could be obtained. Several strains have been obtained, however, which routinely reach titers of 1:800 or greater with 0.5 percent suspensions of chicken erythrocytes. Parallel tests of human serums with the Japan 305 strain and some of the more recent isolates have been carried out. One of these strains which yields higher titers may be substituted in the near future for the Japan 305 as the diagnostic antigen.

Serologic Diagnosis

Not all strains of influenza virus are equally sensitive to antibody in the HI or neutralization of infectivity tests. With the use of some variants the antibody response to infection in humans or animals cannot be demonstrated except by CF tests. On the other hand, many isolates have been studied which are as efficient as the Japan 305 EFME line supplied by the International Influenza Center. Mogabgab has found that fluids from infected monkey kidney cultures may also prove equally satisfactory sources of antigen (personal communication).

Many laboratories have reported diagnostic increases in antibody titers measured with A/Denver/1/57 or older type A influenza viruses in CF or HI tests although the isolates cultured from these patients were in the Asian set. These results are not surprising. The lack of specificity in antibody response to influenza infection, especially with CF tests, has been known for years. Repeated observations of antibody increases measurable in HI tests with strains of influenza virus no longer prevalent have led to the development of the "doctrine of original antigenic sin" (6). Although the mechanisms concerned remain poorly defined, it is clear from results of vaccination experi-

Comparison of number of antibody responses measurable by complement fixation or hemagglutination inhibition tests

| Antibody response | Number | Percent |
|--|--------|---------|
| Total cases diagnosed ¹ ----- | 123 | 100.0 |
| CF positive----- | 94 | 76.4 |
| HI positive----- | 76 | 61.8 |
| CF positive, HI negative----- | 47 | 38.2 |
| CF negative, HI positive----- | 29 | 23.6 |
| CF positive, HI positive----- | 47 | 38.2 |

¹ Fourfold or greater increase in antibody titer measured with either test.

ments and serum absorption tests that antibody response to related antigens is often conditioned by previous antigenic experience. In this epidemic of influenza some patients have responded by producing increased antibody titers against the older virus strains with no detectable production of antibody against the Asian set. Viruses obtained from these cases were always of the Asian variety. Therefore, serologic diagnosis cannot be relied upon as a means of defining the set of the infecting agent but only as defining the broader immunological type.

The observations discussed above appear to lead to the logical conclusion that not much is to be gained by employing the HI test. The CF test will define the type of infection. The series of results compiled in the table, however, make it clear that both tests must be employed to effect a maximum of serologic diagnoses. Although the CF procedure was more often the more sensitive, many cases could not be diagnosed without the use of the HI method. Often high titers were found in the acute phase serum with the CF antigens while HI antibody was very low. In these cases the HI test is most useful. In a surprisingly low percentage of cases, only 38.2 percent, could the diagnostic rise be demonstrated by both tests.

Discussion

Legions of contributors to the store of knowledge about influenza have joined in an effort to study the characteristics of pandemic influenza. Although it is obviously too early at this time to define what has been learned, many laboratory

observations made during the past several years have been dramatically reconfirmed. The central role of the laboratory in providing etiological diagnosis of sporadic outbreaks and epidemics of influenza has been emphasized. Spread from country to country and within geographic areas has been carefully observed. There have been discussions in the past as to whether new variants appear simultaneously in several areas or the spread is from a single source. In the case of Asian influenza, at least, there can be no argument; the new variant arose in China and spread from that point.

Great interest has been focused on the question of whether strains of both the FM and Asian sets of A influenza would circulate. From June through November 1957 viruses isolated in great networks of laboratories all over the world have been of the Asian variety only. The greatest probability is that the older A sets will not be seen again in the near future. If the antigenic variations continue the course set during the past 24 years, we can expect modified forms of the Singapore viruses to appear and circulate during the next 10 years. The great shifts in antigenic composition of influenza viruses have occurred at least three times in our history at intervals of about a decade. Meanwhile, we can expect protection from influenza by vaccination or other antigenic experience with any of the Asian set of influenza virus strains.

Antibody response is often not strain specific in man because of previous conditioning by experiences with other variants of the immunological type. When epidemiological information is desired about more precise antigenic definition of the etiological agent, virus isolates must be examined. Although the serologic diagnosis of influenza is more frequently afforded by CF technique, a significant number of cases will be missed unless the paired serums are also tested by HI tests.

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Berlin Epidemic, 1889

"Professor Virchow has recovered from his attack of influenza; several members of the Imperial family have also been attacked . . . The *National Zeitung* is censuring those who spread pessimistic theories about the epidemic. . . . Official data of the number of cases of influenza here have not been made. It is known . . . that but few families have escaped the plague, and that a third of the population has been ill with it. The medical press refutes the theory that there is any connection between the influenza plague and cholera, although it is known to be a fact that cholera has repeatedly appeared after an influenza epidemic."

—Cable report from *Der Deutscher Correspondent*, Baltimore, Md., *Public Health Reports*, December 14, 1889.

Influenza Control in the Armed Forces

HERSCHEL E. GRIFFIN, M.D.

THE HISTORY of the Armed Forces' interest in influenza is long and generally well known. Certainly the World War I experience has been recalled often enough recently to indicate the concern at least that far back. During that period 1 in every 5 men in the Army contracted influenza, and roughly 25,000 died from its complications. This is nearly half the number of battle deaths in the American Expeditionary Forces. The disease is still potentially important to the military as well as to the population at large.

The modern history of the Armed Forces' activities directed toward the control of influenza dates from December 27, 1940. On that date Lt. Col. James Stevens Simmons, the late dean of the Harvard School of Public Health, wrote a letter recommending the establishment of a "Board for the Investigation and Control of Influenza and Other Epidemic Diseases in the Army." Within 15 days approval was granted by the War Department, and the board, with its formidable title, was established. This agency, now the Armed Forces Epidemiological Board, and its Commission on Influenza are still active. The continuity of the agency is apparent from the fact that two members of the early commission are now on the board, one as its president, and two others are now directors of other commissions.

The major influenza control activities of the

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three military departments could be classified in several different ways. I have chosen to consider them under four main headings: surveillance, investigations, vaccination, and medical care. I shall briefly describe the activities of each of these areas and report our experience so far.

Military Surveillance

Surveillance is maintained, as in civilian public health, by periodic reporting augmented by special epidemiological reports when the occasion warrants. For example, the Army has 176 stations around the world which submit weekly telegraphic reports enumerating new cases diagnosed. Common respiratory disease, influenza, and pneumonia are among the reportable categories. By this means trends may be determined and the overall picture seen. More detailed information is submitted by special telegraphic reports in outbreaks of respiratory disease.

Laboratory surveillance is based on the central laboratory at the Walter Reed Army Institute of Research and extends through the area laboratories in this country and overseas. Each has facilities for viral isolation and serologic identification.

Military medical facilities also participate in civilian reporting programs. Station medical officers comply with the State and local reporting requirements. In turn the three Surgeons General report their experience to the Public Health Service for publication in the *Morbidity and Mortality Weekly Report*. Coordination of effort among military, State, Public Health Service, and World Health Organization laboratories has been close from the beginning of man's ability to type the virus.

Through this surveillance an increasingly clear picture of Asian influenza among the military has emerged.

The most important characteristic of influenza to the military in 1957 was its high attack rate. This was the predominant feature of the early epidemics in Asian populations. But when the epidemic reached our military and naval units in the Far East, where we could focus closer investigative study, it became apparent that the attack rate was not constant. In some units the rate reached 65 percent, in others 10 to 20 percent, and occasionally there were only a few cases. This variation, it was soon determined, was not due to preexisting immunity since antibodies to this virus were entirely lacking in this group. It appeared to be a function of crowding and closeness of contact.

The high rates occurred in units where the men lived, slept, ate, and worked together, such as those aboard naval vessels and in recruit training camps. When the populations were not so concentrated, the rates were low. For example, the outbreak at the San Diego Naval Training Center began so explosively that many first thought it would turn out to be adenovirus disease. Moreover, the rates in recruits were high, and in the cadre, who lived in their own homes, the rates were low. But it *was* influenza. This pattern has now been repeated many times.

A companion feature has been rapidity of spread, or perhaps more precisely the almost simultaneous occurrence of geographically widely separated outbreaks. How the disease first swept through Asia is well known. Its successive occurrence in countries around the world and the early widespread seeding in the United States have been described.

The first confirmed military outbreak in this country occurred in an east coast naval station early in June 1957. For 3 months the laboratories across the country reported occasional virus isolations and significant titer rises from sporadic cases. But there were few outbreaks. Although the virus was widespread, the respiratory disease rate for Army troops in the United States remained relatively constant, below 100 per 1,000 per year in the weekly reports.

Then, in the first week of September, many special epidemiological reports were received. The rate for Army personnel in the United States rose in 5 weeks to more than 750 cases per 1,000 per year, as some 30,000 cases occurred. By mid-October, though, the rate was headed precipitously downward again. At the end of the first week in December it was down to 215. Thus, although person-to-person spread may account for infection with the virus, it alone cannot explain the pattern of the occurrence of epidemic influenza in the Army. The pattern in naval fleet units is a little clearer because of the closeness of the contact and more nearly resembles the spread in Asia or the occurrence of disease in families.

If one focuses attention upon individual bases and ships rather than upon the armed services as a whole, an important mitigating feature of the disease is brought to light. This is the short duration of outbreaks. In military experience most have run their course in 4 to 6 weeks, except where there have been additions to the population. This brevity of duration significantly lessens the effect of even intense outbreaks. In those outbreaks where the overall attack rate reached 25 percent, only 5 to 6 percent were ill at the peak, and then for only a few days. Prevalence is a better index of impact of disease than is incidence.

The laboratory has contributed significantly to surveillance. Its first function is categorization of the outbreak through confirmation of the diagnosis. Our practice is not to submit every case of respiratory disease to the laboratory for study, but to investigate throat washings and serum pairs from a small sample of characteristic cases early in the outbreak. Once the outbreak is categorized as influenza, cases are diagnosed clinically.

Early in the summer it became apparent that "all is not flu that fevers." Outbreaks presumptively diagnosed as influenza were proved in the laboratory to be as diverse as streptococcal exudative pharyngitis, common cold, and salmonellosis. One wonders at the reliability of the cumulative numbers being generally quoted.

The laboratories have been examining the homogeneity of the virus. Remember that early in 1957 an influenza A' virus was widely

disseminated. In April the Asian variant started its world tour. The question has been raised as to whether another strikingly different A virus would appear this year. Experience would say no, and so far the laboratory has borne out experience. But vigilance is being maintained for the early detection of the unexpected, should it occur.

Surveillance, then, has identified the close, continuous contact, such as that of the family or the crew of a ship, as the hazardous contact. Potential control measures involve preventing transmission of the virus within these close groups, rather than curtailing public gatherings. However, this does not preclude closing schools for administrative reasons because of high absentee rates or illness among teachers.

Investigative Efforts

Investigations are being carried out on many fronts so that when the time comes to draw conclusions about this epidemic, those conclusions may be based on data and not on speculation. We believe that we would be seriously remiss to allow this, the most significant occurrence of influenza in almost 40 years, to pass poorly or inadequately documented.

These investigations are being conducted at all levels. Prototype protocols for the epidemiological description of outbreaks at individual installations have been widely distributed. When they are returned, there will be a large body of information reported in comparable format, with data commonly categorized. We hope that this procedure will allow pooling of the data and permit an orderly and logical progression from the specific to the general when evaluations are made.

Military laboratories and research groups are also conducting studies. The early work of Dr. Maurice R. Hilleman and the Walter Reed Army Institute of Research group in identifying and categorizing the virus and in evaluating its antigenicity may be mentioned. Important work in clinical, laboratory, nursing, and other aspects of the situation is being done by other laboratories. We are continuing to finance the projects of the Armed Forces Epidemiological Board and its Commission on Influenza.

All this research, which represents a rather considerable commitment of personnel, facilities, and money, is not considered an ancillary function or an esoteric exercise, but an essential control activity. Just as the knowledge gained from the more than 15 years of previous study allowed prompt action when the new strains appeared, so the research carried out this year will continue to improve our position of preparedness for the future. At any rate, an effort is being made to avoid what Dr. Edward G. McGavran has categorized as the "loss of invaluable information through the failure to observe and record experience."

Vaccination by the Services

Vaccination represents the only really effective control measure available in combating influenza. The actual program of immunization is simple. Military personnel worldwide have received two doses of vaccine. Overseas, the same course was offered on a voluntary basis to civilian employees and dependent personnel. At installations in this country where supplies exceeded military need, one dose has been offered to dependents and civilian employees.

I have been asked to comment on the intracutaneous route of administering influenza vaccine.

The primary reason this route has been considered at all is that it enables the available supply of vaccine to reach a larger segment of the population. Hilleman and others have reported that the antibody response to intracutaneous vaccination was "almost as good" as the greater amount given subcutaneously. He noted that "this finding may be significant in situations where shortage of vaccine necessitates stretching the supply." Similarly, the special Committee on Influenza of the American Medical Association stated that the subcutaneous route was preferable, though the intracutaneous route was offered as a possible alternative.

In the Armed Forces all past studies and experience regarding the preventive effect of the vaccine, as opposed to antibody stimulation, have been based on the subcutaneous route. So this route was decided upon if the supply should prove sufficient. In one service, the supply for

the first dose was limited and the intracutaneous route was used in part of its personnel. The subcutaneous route was used throughout for the second dose.

As yet we have no data on the protective effect of the intracutaneous injections. Studies are under way to provide factual data on which to base future action.

Experiences in Medical Care

It is not customary to consider medical care a control activity. But in this disease care and control are interrelated. Clinical features have epidemiological significance, and epidemiology guides care. There has been nothing peculiar to the military in its hospitalization and therapy policies. Conservatism has been the rule. Segregation of patients, preferably without hospitalization for the uncomplicated cases, and symptomatic therapy with avoidance of antibiotics have been practiced in military as well as in civilian medicine.

The first action taken in medical care was obviously operational planning. It was necessary to estimate the capability of the military medical services in order to provide personnel, supplies, and facilities to meet the load. Because these medical services are designed for rapid expansion of their reserve capacity, and personnel and supplies are mobile, it was concluded that the capability was sufficient to meet the anticipated load.

The first test of this conclusion was in the Philippines. Clark Air Force Base reported

a sharp, severe outbreak, but needed no outside help to manage it. Now that there have been scores of such experiences, it has become clear that the military medical services are indeed capable of handling outbreaks of this magnitude. Even aboard ship, where expansion capability is limited, facilities have been adequate, though at times severely strained.

Clinical experience may be briefly summarized. Cases have been acute, with temperatures averaging about 103° F. but recovery has been rapid. The average time lost has been about 4 days. Pneumonia diagnosed on clinical grounds has been seen in less than 1 percent of respiratory disease admissions. This includes primary pneumonia, with no association with influenza. In about 5 percent of the respiratory cases where chest X-rays have been taken routinely, some degree of pneumonitis has been reported.

Association of the influenza virus and a bacterial hitchhiker has not been observed, even in areas where streptococcal disease is endemic. In the Army one death has been associated with influenza. The few other pneumonia deaths have been intensively studied, but no evidence has been elicited which would indicate that influenza played a role in them.

In regard to the future, I can say only that this is our program; so far it has served us well. We intend to continue it as described, though ever alert to a change in the situation which would warrant modification or revision. We are prepared for such a change, while not necessarily predicting it.

Public Information and Education

J. STEWART HUNTER

ON SEPTEMBER 1, 1957, a New York newspaper carried a roundup story on Asian influenza with this lead sentence: "The greatest teamwork in medical history has been stimulated by the threat of a spread of Asian influenza this fall." Later in the story the reporter wrote: "Communications from Geneva [World Health Organization] through the world's capitals to laboratories, health departments, universities, vaccine manufacturers, local physicians, and the general public is the key to today's medical teamwork."

Undoubtedly the Nation's readiness with respect to Asian influenza owed its heaviest debt to intercommunication among nations, among medical and scientific and public health professions, between industry and government, and between all of these elements and the populace. The interchange of information has been constant since June 10, 1957, when Surgeon General Leroy E. Burney called the first meeting of representatives of medical and health professions to discuss the influenza epidemics then appearing throughout the Far East and to consider courses of action should the disease spread to this country.

In this effort the role of public information and health education as an organized and integrated part of the Public Health Service's Asian influenza program has been fully recognized and fully employed.

In testimony before the Senate Appropriations Committee on behalf of a request for sup-

plemental funds for influenza activities, the Surgeon General said:

In the last analysis, the success of any large-scale effort to control an influenza epidemic depends upon an alert and informed public. We must avert the dangers of indifference on the one hand, and of undue hysteria on the other. This calls for current and reliable public information on the exact nature of the problem and on the actions which need to be taken. We plan to provide these informational and educational services, in cooperation with State and local health departments and professional groups.

The Congress appropriated \$110,000 for public information and educational purposes.

The Public Health Service has long recognized the importance of these activities, and information and public education are implicit in all its programs. In fact, the Service's basic legislation directs the Surgeon General to report on health matters periodically to the public and to the Congress, and to engage in health education activities. The Asian influenza program, however, represents a positive and explicit directive from the Congress to carry on an information campaign.

Two Related Tasks

In this campaign, there were two distinct but related kinds of tasks. The first was to inform the public about Asian influenza and to alert people to the possibility of an epidemic in this country and of the actions taken to deal with it. The second was to encourage use of the new influenza vaccine as the only preventive measure available.

The first task was essentially a public information program. Like all similar programs, it entailed not only reporting fully on developments as they occurred but an educational effort

Mr. Hunter is Assistant to the Surgeon General for Information, Public Health Service. This article is based on a paper presented at the 1957 meeting of the American Public Health Association in Cleveland, Ohio.

as well. The major emphasis was through mass media: newspapers, magazines, radio, television, films, pamphlets, and exhibits.

These facilities offer the most effective way of delivering a message to the eyes and ears of millions in the shortest possible time. This, of course, was the necessity which we faced. Information fully reported and properly interpreted through such media obviously is fundamental to the development of public understanding. There are, of course, many useful and essential channels.

The second task, to encourage use of vaccine, called for a sustained campaign of health education. In this campaign, the Service used both the mass media and the techniques of personal communication, although the emphasis, because of the limitations of time, had to be on the former. One of our important goals was to provide assistance to State and local health agencies, to professional groups, and to industry in their own information and health education programs.

To accomplish the first task, that of alerting and informing the public, the Service strengthened and intensified its means of imparting information through normal channels. For example, press releases were issued and press conferences were held immediately following all major policy decisions. Between June 7 and the beginning of December, the Service issued 35 press releases on Asian influenza alone, averaging more than 1 a week. In addition, the major meetings, such as the Surgeon General's special conference with the State and Territorial health officers in August, were open to the press and to representatives of other media. And, of course, State and local health officials, medical societies, and others interested in the program were kept regularly informed of incidence, vaccine supply, and other developments.

Considerable time and attention were given to working with magazine editors, staff writers, and free-lance contributors. Articles on Asian influenza have appeared in at least 32 magazines of wide national circulation, including *Reader's Digest*, *Life*, *Good Housekeeping*, and the various news weeklies. An incomplete tally shows that 60 such articles appeared from September through November 1957. In addition, there were numerous reports in specialized jour-

nals, trade magazines, house organs, and regional and State publications.

Papers and articles also appeared regularly in professional and scientific journals. Within the same 3-month period, for example, 14 articles on Asian influenza appeared in the *Journal of the American Medical Association*, several of them written by Public Health Service officials. There were similar articles in the periodicals of public health, nursing, pharmaceutical, and other professional organizations.

This was in line with another implicit directive from those who planned and administered the influenza program: a free and rapid interchange of information among professional groups. It was the job of public information and education personnel to apply their specialized skills and techniques to keep the information flowing and current. The material from the special meeting with the State and Territorial health officers, for example, was quickly reproduced and widely disseminated. The journals of the American Public Health Association, the American Medical Association, the American Hospital Association, the American Pharmaceutical Association, the nursing organizations, voluntary health agencies, and the State health departments spread the word rapidly to private physicians and other key people.

In fact, effective information services originated from a wide variety of sources and were conducted in an excellent spirit of cooperation. It should be emphasized strongly that the Asian influenza information program has been a cooperative enterprise throughout, with the noteworthy assistance of the communications industry itself. The reporting of the Asian influenza story by press, television, and radio, and by professional and specialized organs has been restrained, responsible, and enlightened. The newspapers and other media have almost without exception shown a ready understanding of the problems faced by health officials and a willingness to help.

A good example of this kind of cooperative action was a television program late in August on Westinghouse station KDKA in Pittsburgh. This program was produced by a joint effort of the television station, and the American Medical Association, the University of Pitts-

burgh, the Allegheny County Medical Society, and the Public Health Service. The participants included Dr. Burney and other officers of the Service, and Dr. George F. Lull of the American Medical Association. The show was carried in five major cities and over the educational television network of the University of Michigan. It was also kinescoped, and prints were sent to all the States. By mid-November, the film had been shown more than 200 times on 150 television stations in 41 States.

Many other television and radio appearances by senior officials of the Service, of State and local health departments, and of professional organizations also helped tell the story to the American people.

Films and Pamphlets Issued

In another information field, the Public Health Service developed extra footage and otherwise brought up to date a film made in 1950 entitled "The Epidemiology of Influenza." Copies of this film were distributed for use by the States. Reports received by the Service indicated that the film had wide use on television and at public and professional meetings.

A number of new publications on influenza were developed by the Public Health Service and given wide distribution. These included a fact sheet on Asian influenza, a revision of the basic health information leaflet on influenza, and pamphlets entitled, "What You Should Know About Asian Flu" and "If Asian Flu Comes to Your Community."

Pamphlets and other educational material were also issued by others involved in this effort. The American Medical Association developed a packet of material for State and local medical societies. The American National Red Cross issued a special Asian influenza information kit to its State and local affiliates. Voluntary health agencies, professional groups, the pharmaceutical organizations, and industry distributed special bulletins, pamphlets and articles for the general public as well as for physicians, pharmacists, and other health personnel.

Speaking engagements, including formal papers and informal talks before a variety of professional and public groups, helped inform additional thousands of people. Public Health

Service officials delivered at least 23 addresses on Asian influenza from September through November, an average of about 2 each week. These were given in such major cities as New York, Boston, Philadelphia, San Francisco, St. Louis, and Chicago, and before groups ranging from local civic clubs to meetings of national voluntary and professional associations.

All of the foregoing, as well as other communications techniques, were used to perform the first of the two tasks previously mentioned, to inform the public. These techniques also served as an integral part of a sustained health education campaign. In addition, other educational measures were developed to encourage vaccination against the infection. All State health educators, for example, received guides on how to organize for local community action specifically adapted for this campaign. Health educators were assigned to the regional medical officers of the Public Health Service to work with States and communities and to conduct special surveys of local problems, needs, and attitudes.

A series of 14 radio spot announcements, 4 television announcements, and 5 newspaper advertisements in varying sizes were sent to public health educators and information personnel in all of the States and Territories for their use in local situations. In the 3-month period, 15 such mailings were completed. The materials were designed to be flexible and easily adaptable to the needs of local communities.

A great stimulus to the vaccination promotion program was a special campaign launched as a public service by the Advertising Council, Inc., in early November. Sponsored by the Public Health Service and the American Medical Association, the campaign was prepared by the voluntary task force advertising agency, Young and Rubicam, Inc. Its purpose was to carry the message of vaccination to all the newspapers and radio and television stations of the country. A kit containing four newspaper advertisements in varying sizes was shipped to all newspapers in the United States. Similar material was sent to all television and radio stations. The television spot announcements were narrated by the noted commentators, Edward R. Murrow, John Daly, and Dave Garroway.

Copies of related Advertising Council materials were sent simultaneously to State health officers and their health education staffs. Local sponsors of the messages were asked to check with their medical and public health authorities before using the advertisements in newspapers or on the air. In this way, State and local agencies were given an opportunity to participate in the campaign. Several local information and education efforts, in fact, were geared to the appearance of these ads.

In this effort, the Public Health Service had the benefit of early assistance and counsel from an ad hoc Advisory Committee on Information and Education, whose members were health educators in State and voluntary health agencies. The committee included Robert Yoho of Indiana, James Quinlivan of New York, Elizabeth Reed of Florida, Thomas Gibson of Georgia, Milton Kossack of Louisiana, and Sol Lifson of the National Tuberculosis Association. They responded generously to the request of the Public Health Service for advice on these matters and contributed substantially to the success of the program.

The Program's Effect

It is pertinent at this point to ask, and attempt to answer, the questions: Was the program successful? Did it achieve its purpose "to alert but not to alarm" the Nation and to encourage people to be vaccinated? The evidence seems conclusive that the campaign did indeed achieve its objectives. Probably never before in the history of the Nation has the public become so quickly and so well informed on a matter of public health importance.

The findings of the Gallup Poll of September 23, 1957, are worth repeating in this connection. Of the adults questioned:

- 92 percent had heard or read of Asian influenza.
- 76 percent knew that there was a vaccine against the disease.
- 65 percent planned to be vaccinated.

These findings are all the more remarkable when one considers the unprecedented speed of the entire influenza development. Within less than 5 months a new strain of influenza virus was identified and isolated; a new vaccine was developed, tested for safety and effec-

tiveness, and produced in mass quantities; plans were developed and put into effect for a nationwide voluntary distribution system; millions of Americans were vaccinated; and an emergency medical care program was devised and put into effect in many local communities.

Communications paved the way for quick and effective action at every point in this development. Without a strong and active information program, the public might have floundered in ignorance and fear and there might have been uncertainty among professional groups. With it, there was a rational period of preparation and a cooperative mobilization of resources. This is not unique or even surprising. The American people, when well informed with the facts, react in this fashion.

The evidence of acceptance and understanding is clear. But was the job well done? Was too much information centralized in Washington, to the detriment of local programs? And was the entire development sensationalized beyond its public health significance either by the Service or others engaged in public information?

We believe that the answer to these questions is "No." While everything was done to alert people to the situation and to see that the information disseminated was accurate, it must be kept in mind that Asian influenza was not made into front-page news by virtue of a public information program. The story had many elements of newsworthiness: a disease of mysterious, sudden origin in a remote region, a rapid spread throughout the world, a catastrophic potentiality, and a unique scientific and industrial achievement of swift identification of a new virus strain and large-scale production of a new vaccine.

The problem was not whether to publicize the Asian influenza story. The story would have been told inevitably by the communications media because of its inherent public interest. The problem was instead to use the techniques of communication and education to let reporters, the public, and the health professions know precisely what was at stake, why action was necessary, and what kind of action

was called for by each group. And the aim was to draw each group into the national effort, as an active planner and participant.

Joint planning and joint action in the information and education effort as well as in other phases of the program were key elements in the control of Asian influenza. One of the important byproducts of this campaign has been the strengthening of relationships among

those responsible for communications programs in Federal, State, local, and voluntary health agencies. This should stand us in good stead not only in the event of future emergencies but in the conduct of information and education for continuing health services. Information is vital to health programs, and its vigorous employment will help bring closer the goal of better health for all.

PHS Material on Influenza

The following materials prepared or issued by the Public Health Service relating to the epidemic of Asian influenza include films, publications, and articles in *Public Health Reports*.

Film

The Epidemiology of Influenza, an updated 1950 film (16-mm., sound, black and white, 13 min.), shows the fight against influenza since the pandemic of 1918. The historical significance, behavior, and periodicity of the disease, its clinical picture, the WHO program including the establishment of look-out posts, the physician's role in reporting, and laboratory procedures are all depicted. It can be obtained on loan from the Communicable Disease Center, Public Health Service, Atlanta, Ga.

Publications

Proceedings of the Special Conference of the Surgeon General of the Public Health Service with the State and Territorial Health Officers, August 27-28, 1957, mimeographed, available in limited quantities, without charge, from Public Inquiries, Public Health Service, Washington 25, D. C.

Public Health Monograph No. 48 (PHS Pub. No. 544), A Review and Study of Illness and Medical Care, with special references to longtime trends, by Selwyn D. Collins, 1957, 86 pp. (An extract from

this study, Influenza in the United States, 1887-1956, covering pages 51-74, is published as a separate.)

Articles

The September, October, and November 1957 issues of *Public Health Reports* as well as this one carry papers on influenza:

In the September Issue—

Influenza Epidemic Alert, by Surgeon General Leroy E. Burney, p. 767.

Influenza Epidemics During 1951-56 With a Review of Trends, by Selwyn D. Collins and Josephine L. Lehmann, pp. 771-780.

A short report on the Asian Strain of Influenza A with a Calendar of Major Events in the 1957 Outbreaks, pp. 768-770.

In the October Issue—

The Philippine Influenza Epidemic of 1957, by Matthew Tayback and Arturo C. Reyes, pp. 855-860.

Testing Influenza Vaccines at NIH; Selected Steps in the Procedure To Insure Safety, Purity, and Potency (pictorial), pp. 861-864.

Pan American Cooperation on Influenza, p. 917.

In the November Issue—

Health Officers' Meeting on Asian Influenza, pp. 998-1000.

Mobilization of Private Physicians

HAROLD C. LUETH, M.D.

THE THREAT of an Asian epidemic in the United States confronted the medical profession early in June 1957. The board of trustees of the American Medical Association promptly designated the Committee on Civil Defense as the Special Committee on Influenza and assigned it the additional task of exploring the possibility of Asian influenza in the United States, the extent and nature of the threat, and the means with which the threat could be met.

On July 9, representatives of the American Medical Association, the American Hospital Association, and the Public Health Service met at the AMA headquarters to draw up a program whereby the individual physician could be informed of his role should the threat be realized.

As a result two principal programs were developed. One provided the physician with necessary information; the other dealt with organizational matters.

To assure the physician that he would get all the scientific information concerning the biology, epidemiology, clinical characteristics, and therapy of Asian influenza, the information program prepared articles and notices for publication in the *Journal of the American Medical Association* and special notices for State and county medical journals.

Dr. Lueth is clinical professor of medicine, University of Illinois College of Medicine, Chicago. He is a member of the American Medical Association's Council of National Defense, chairman of the Committee on Civil Defense, and chairman of the Special Committee on Influenza. This paper is based on comments at a symposium on Asian influenza held by the American College of Preventive Medicine and the health officers' section at the 1957 meeting of the American Public Health Association.

The organizational program was divided into several different activities. First, State and county organizations were notified and advised to take immediate action on the possible threat. One of the first things noted, of course, was that vaccination was the only possible means of combating Asian influenza. It was simultaneously recognized that the vaccine would be in short supply, requiring some scheme of allocation.

Next, the Special Committee on Influenza suggested that the vaccine be allocated on the basis of local determination, using the facilities and resources within communities. It was assumed that the local health profession working with the local public health officer and other community officials could best ascertain how vaccine in short supply could be divided and utilized advantageously.

An action group was then formed to allocate the determinable amount of hospitalization available. It was seen immediately that there would be a wide demand for hospitalization through Blue Cross, Blue Shield, and other insurance programs. Since it would be difficult for the physician to deny hospitalization to a large group of people, the committee felt that some scheme should be forthcoming for orderly use of hospitals.

Because of these problems, notification of the decisions were authorized by the board of trustees on July 20. At the same time, the board designated two of its members, Dr. Hugh Hussey and Dr. James Appel, to sit with the Special Committee on Influenza. By July 26, the notifications went out to each of the county and State representatives, and they were urged to take action.

It should also be pointed out that by July 20 there was some concern about a possible wide-

spread, injudicious use of antibiotics, and a preliminary statement was sought from the Council on Drugs of the American Medical Association. The council issued a statement advising a reasoned and cautious scientific application of antibiotics in proved and indicated cases.

On August 14, the Surgeon General of the Public Health Service called a meeting in Washington, D. C., for all representatives of national health agencies and voluntary health groups to decide how to cope with this particular problem. Three recommendations ensued:

First, the Surgeon General's program should be fully supported and endorsed by all organizations whose representatives were in attendance.

Second, local health groups or councils should determine how vaccine and hospitalization should be allocated within local communities.

Third, a meeting of the State health officers should be called by the Surgeon General at the earliest possible moment so that their efforts could be integrated or coordinated with other agencies.

The State and Territorial health officers meeting was held in Washington on August 27 and 28, and one of the essential ideas that came out of the meeting, in addition to those dealing with cooperation and allocation, concerned the proper use of laboratory work. There was some apprehension that physicians might not at first use the resources of laboratory techniques to pinpoint the occurrence of Asian influenza, but would rely on clinical signs. It was also feared that, in some instances, too much public awareness would lead overanxious patients and physicians to flood laboratory resources with an unnecessary number of specimens. A carefully worded statement urged physicians to use laboratory resources to determine the presence of an epidemic, but to allow the State and Public Health Service laboratory officers to select samples for testing.

The Council on Drugs, on September 7, enjoined physicians to use antibiotics only when indicated and then to use them in large enough doses to combat the offending secondary type of organism.

On September 19 the public information program was launched with a television announce-

ment by the president of the American Medical Association. Recordings and scripts for radio and television were on hand for local members of the profession to use should influenza strike their communities.

By September 27 the program had developed and events had changed enough to warrant a second notification from the Special Committee on Influenza to the same county and State medical societies and health groups, advising them of current developments and again asking them to take appropriate action.

It is interesting to note that those medical societies with well-organized plans and with active national emergency medical service committees or civil defense committees quickly took this material, redefined it, reworked it in the light of their particular needs, and disseminated it to their local groups. Just to show how rapidly some States worked, the Mississippi State Medical Association was able to prepare and mail within 1 day after notifications were received a plan for the entire State.

On September 27 the Special Committee on Influenza took definitive action on the use of false and misleading information concerning the efficacy of drugs. As soon as Asian influenza received wide publicity, many took the opportunity to claim some therapeutic advantage of their particular pharmaceutical product. The Special Committee on Influenza emphatically restated that false and misleading statements about drugs should not be published.

On October 5 the Special Committee on Influenza reviewed the whole program and reemphasized its importance. While the committee was pleased that the program went on rapidly and efficaciously, it was cognizant of deficiencies and failings, and in an effort to have a more effective future method of operation each State and county medical society was requested to submit its particular program to headquarters of the American Medical Association. These reports will be carefully and critically examined as soon as possible in order to formulate a standby national program that will be useful should it be required in any future emergency.

In summary, what has the individual physician learned as a result of this program?

First, the physician has been profoundly impressed with the tremendous network and capa-

bilities of all governmental health agencies working in such close cooperation so as to make it possible to identify, isolate, and recognize this particular virus, and to make the information obtained readily available to physicians.

Second, the physician has recognized the importance of having channels of communication open to physicians whereby they can be alerted and quickly supplied with medical information.

Third, he has found that those physicians who had good immunization programs as part of their daily practice could incorporate the Asian influenza program without any difficulty.

Fourth, the thoughtful physician has discovered that his place in the community has been

more thoroughly defined and delineated. He sees more clearly where he fits in relation to the local health officer, the professional agencies, and voluntary health agencies in carrying out his daily work as a physician.

Fifth, the physician has learned that the Asian influenza program is essentially an emergency medical service program and a phase of civil defense. A critical review of each physician's actions during the program should result in the adaptation of the best and most significant ideas for his daily practice, leaving those which are not a part of daily practice readily available in case they are ever needed again.

Mattison Appointed APHA Executive Secretary



Dr. Berwyn F. Mattison, secretary of health of Pennsylvania since 1955, has been named executive secretary of the American Public Health Association.

Previously, Dr. Mattison was commissioner of health in Erie County, N. Y., from 1948 to 1954, and in Yonkers, N. Y., from 1946 to 1947. He entered the New York State Department of Health in 1941, serving, during the next 6 years, as assistant district State health officer and district State health officer.

Dr. Mattison received his medical degree from McGill University, Montreal, Canada, in 1936, and his master of public health degree from Johns Hopkins University in 1941.

In addition to membership in numerous professional societies, Dr. Mattison holds a number of committee and board appointments including chairmanship of the Advisory Committee to the Surgeon General (PHS) on Training Needs in Public Health and of the Pennsylvania Advisory Health Board.

Lessons in Planning for Epidemics

MACK I. SHANHOLTZ, M.D.

GIVEN FOREWARNING of an epidemic of influenza, early planning is an obvious step. We have learned a great deal from the experience of planning for the present epidemic.

In working with the Asian influenza epidemic, we have learned some things that will be useful in planning for the total fight against influenza. In addition to what we know about the Asian influenza virus, the vaccine, and immunity through use of the vaccine, we have learned that cooperation between State and local health departments and State and local medical societies is necessary for the success of any program combating influenza.

I believe we have learned, too, what the health department's proper role is in such an activity. The health department acts as an information center, first of all, for the dissemination of educational material. It also acts as a central tabulation center on cases, distribution, and deaths. It helps in setting up priority systems for the vaccine as well as diagnostic facilities for the identification of the virus. And it helps organize community resources for stricken areas.

The experience gained from the present epidemic also suggests measures that should be undertaken—and others that should be avoided—in the event of another epidemic.

Dr. Shanholtz is the State health commissioner for Virginia. He is also secretary of the Association of State and Territorial Health Officers. This paper is based on comments at a symposium on Asian influenza held by the American College of Preventive Medicine and the health officers' section at the 1957 meeting of the American Public Health Association in Cleveland, Ohio.

Should that event come to pass, I should suggest the following:

Planning should be done by the two State groups most vitally interested and concerned in setting up a control program: the State health department and the State medical society. The first meeting for consideration of epidemic control should be limited to these two groups; larger groups of people, of whom some may not be too well informed, will serve only to waste time and create confusion. It is better that a small group devise the framework of a control program before calling in others to fill in the details. After the first meeting, however, allied medical groups, voluntary health agencies, and appropriate community groups should aid in preliminary planning.

In the event of another epidemic, State and local health departments and medical societies should present a united front to further a successful community control program. At the very outset, a State policy must be formulated covering all aspects of such a control program. Local groups can then plan programs for their respective communities within the framework of State policy. The State should also anticipate emergency needs and locate special resources.

I should recommend, as another important phase of planning, the development of an education program that would prepare every citizen for an epidemic. On this score, I might suggest that we begin at home.

As for educational materials, I feel it is necessary to have a special joint committee, with representatives of organized medicine on it, to appraise the various educational materials that might be sent out to the public. In the beginning of the Asian influenza epidemic we

were afraid of overselling and creating a panic. We were also afraid of creating a greater demand for vaccine than we could supply. A joint committee decided then, and should decide in the future, the quantity and timing of information.

Future epidemics could be handled more easily if local communities were organized, with certain variations to fit particular situations, very much like the States. Some community groups, of course, are already organized. Local health groups, such as health departments, medical societies, nurses' associations, and pharmaceutical associations, and voluntary health agencies, such as the Red Cross and civil defense groups, are examples. But there are other groups that could be organized more effectively; I mean those working in education, industry, and community affairs.

It might also be well to consider the reservoir of retired, inactive nurses that could be used more effectively. The Red Cross and civil defense agencies have listed them. I feel that we ought to have these nurses on a standby basis where they might assist in an emergency.

Other resources could be tapped. An epi-

demio calls into being a vital need for additional transportation and clerical personnel and emergency telephone services. It might also be worthwhile to consider providing nursery care for children of graduate nurses who are called to active duty.

My final recommendation concerns a better means of allocating vaccines, especially when the supply is far smaller than the demand. In the 1957 influenza epidemic, many people wanted vaccine and wanted to be first. Some managed to get vaccine in spite of priority grouping and advice. And some large groups received vaccine ahead of any classification. Some of the ensuing anxiety may be attributed to overeducation, but my own feeling is that much of the fear was engendered by a memory of the 1918 epidemic. In any case, a more coherent system of allocation is needed.

These are some of the lessons we have learned, as I see it, from the Asian influenza epidemic. Working together has been a very good exercise for all of us. We have learned again, above everything else, that a united, co-operative effort on the part of health officials and practicing physicians is all important for success in any endeavor in the field of public health services.

Emergency Recruitment, 1918

"Better than volumes of reasoned arguments, the present epidemic of 'Spanish' influenza has shown in concrete form how important it is to have attached to the United States Public Health Service a reserve organization which can be mobilized in times of emergency.

"With the widespread occurrence of influenza in the vicinity of Boston, and the unmistakable signs of its beginning elsewhere, urgent calls were addressed to the United States Public Health Service to furnish medical and nursing relief to stricken communities. All available regular officers were detailed to the stricken communities, but the number available for such detail was insignificant compared to the urgent need occasioned by the epidemic. Moreover, the bureau had no nurses available for service in epidemic."

—*Public Health Reports, October 25, 1918.*

Research Programs on Asian Influenza

JUSTIN M. ANDREWS, Sc.D.

NEARLY a month before the first group of cases of Asian strain influenza were diagnosed in American civilians (high school conference at Davis, Calif., June 21-30, 1957), special research on various aspects of this disease had been started at the National Institutes of Health of the Public Health Service. Since then, 6 of its 13 major subdivisions, the Division of Biologics Standards, the National Institute of Allergy and Infectious Diseases, the National Heart Institute, the National Institute of Mental Health, the Clinical Center, and the National Institute of Neurological Diseases and Blindness, have participated in meeting this investigational exigency.

In late August, a special conference of State and Territorial health officers was called by the Surgeon General to review developments and to coordinate and plan future activities relative to the epidemic. At this meeting, the recommendation was made that a group of outstanding medical scientists representing the several areas of specialized knowledge associated with influenza be appointed to advise the Surgeon General regarding research planned to minimize the morbidity and mortality resulting from Asian influenza. This suggestion was implemented in September.

The following is a brief recapitulation of influenza research being carried on or supported by the National Institutes of Health and of the organization and accomplishments of the Public Health Service Influenza Research Committee.

Division of Biologics Standards

While influenza vaccine is not a new product and new strains have been added to the vaccine in the past, the vaccine situation faced

by the Division of Biologics Standards and by the manufacturers in the early summer of 1957 differed from previous ones in the degree of urgency and in the size of the production goal.

Various isolates of the Asian influenza virus were supplied to licensed manufacturers of influenza vaccine by the Division of Biologics Standards as soon as they were received. The first of these, A/Jap/305/57, was sent out by the division on May 12, 1957. One of the immediate problems encountered with the new strain was the selection of a particular isolate which could be best adapted to producing satisfactory virus growth in the chick embryo. In addition to Japan 305, A/Jap/306/57, A/Jap/307/57, A/Formosa/1/57, and A/Singapore/1/57 were studied by both the division and the manufacturers for growth potential and other characteristics. As a result of these studies, it was decided that no particular isolate would be designated for vaccine production, but that the manufacturer would use, from among those distributed by the Division of Biologics Standards, the Asian strain isolate showing the best growth characteristics in the hands of the individual manufacturer. The type of potency test used with previous influenza vaccines had been of the mouse protection type which requires 4 weeks or longer to complete.

Initially, it was not possible to use this test for the Asian strain vaccine since a strain lethal for mice in sufficient titer had not been developed. Neither had there been sufficient

Dr. Andrews, director of the National Institute of Allergy and Infectious Diseases, was requested by the director of the National Institutes of Health, Public Health Service, to act as the focal point for all of the Institutes' activities concerning influenza.

time to develop information as to what constitutes an adequate level of antigenicity as demonstrated by such a test. In these circumstances, it was decided that since chicken cell agglutination (CCA) units per milliliter are related to antibody response, Asian strain influenza vaccine would be released on CCA values alone. This necessitated the development by the division of a CCA reference standard, which was furnished all manufacturers. It was then necessary for the professional staff of the division to work closely with the technical staffs of industry in order to standardize techniques and obtain uniform results in the performance of this test.

While vaccine continued to be released during the emergency on the basis of CCA values alone, efforts continued on the development of a mouse-adapted Asian strain and of a standard reference vaccine. By mid-August such a strain was developed and was furnished the manufacturers for trial potency tests in mice. By mid-November, when the production cycle of monovalent Asian strain vaccine was nearing conclusion and a return to production of a polyvalent vaccine was near, the division had developed and given the manufacturers a standard reference vaccine containing the Asian strain. On December 1, 1957, it was, therefore, possible to require again that potency determination be based upon the same antigenicity tests in mice as were required for all influenza vaccines prior to July 1957.

NIAID Projects

Scientists at the National Institute of Allergy and Infectious Diseases have a well-established and time-honored record of research activity on respiratory ailments, including influenza. Their current interest in the latter has resulted (a) in the development of a hemadsorption-tissue culture technique which facilitates and expedites the recognition of type A influenza virus (1), and (b) in the demonstration, by means of live-virus challenge experience in human volunteers, that the Asian influenza vaccines available in July 1957 conferred definite but not complete protection against infection and reduced the severity of infection (2).

For several years, studies of the characterization and epidemiology of viral agents have been conducted in three local orphanages or homes for children. In these institutions new respiratory and enteric disease agents are being introduced by newcomers and transmitted continually within the closed populations. Periodically, inmates are systematically sampled for pathogenic microbiota on arrival and during and after clinical episodes. Thus, it has been possible to follow with considerable precision the entrance, spread, and departure of specific microagents of disease. It was assumed in advance that these institutions would be invaded by Asian strains of influenza. Plans were made and are now being implemented for determining the epidemiological patterns of influenza outbreaks and the relation and significance to influenza of complicating disease agents under conditions of different levels of vaccination. The etiology of all severe and fatal cases will be studied intensively with particular reference to antibiotic-resistant bacteria.

Cases of unusual interest will be admitted to the Clinical Center for more sophisticated clinical investigations and determinations than are possible elsewhere.

Limited studies on pregnant women and infants are also under way at hospitals in the metropolitan Washington area. Hemagglutination antibody responses and local and systematic reactions to 1.0 ml. subcutaneous injections of 200 CCA units Asian strain vaccine are being evaluated in 51 women vaccinated during the 36th week of pregnancy. Their infants will be examined at delivery for hemagglutination inhibition antibodies. Some 30 newborn babies have been vaccinated with 0.1 ml. of 200 CCA units Asian strain vaccine, half of them subcutaneously and the rest intradermally. They, too, are being followed in order to detect antibody responses and reactions.

The National Advisory Allergy and Infectious Diseases Council at its meeting on June 27-28, 1957, exhibited lively interest and concern in the impending epidemic. The council unanimously affirmed a resolution proposed by its Ad Hoc Committee on Influenza emphasizing the moral obligation of the council to make available the means for studying the diagnostic,

clinical, epidemiological, therapeutic, and prophylactic aspects of the prospective epidemic. The council recommended to the Surgeon General that the national supply of reagents needed for the diagnosis of influenzal and complicating disease agents be augmented, and that additional support be sought for extending research grants and increasing the intramural influenza investigations of the institute. It further proposed that a conference of key research personnel be called to assist in planning and designing influenza studies.

Administrative plans for implementing these recommendations were approved promptly by the Surgeon General. Funds for intramural influenza research were made available, and the sum of \$350,000 was reserved for influenza research grants. Laboratories and individuals with special interest and competence in respiratory disease study were encouraged to submit applications for research on various aspects of Asian influenza, with special emphasis on staphylococcal complications, and on evaluative studies of antibiotic prophylaxis against post-influenza pneumonia in high-risk patients, as recommended by the Public Health Service Influenza Research Committee. Some 40 requests for \$618,566 were received and reviewed promptly by the Microbiology Study Section and the National Advisory Allergy and Infectious Diseases Council. Of these, 13 for \$187,347 were approved for immediate payment. Subjects of investigation include serologic diagnostic technology, clinical aspects, therapy, basic viral studies, vaccine effectiveness under varying conditions of concentration and injection, complicating agents and conditions, etiology and virulence, epidemiology in community and institutional populations, and establishment in lower animals.

Heart Research Grants

At its meeting on June 20-22, 1957, the National Advisory Heart Council, recognizing the opportunity for studying some of the unsolved problems presented by the 1918-19 influenza epidemic concerning sudden, unexplained collapse and death, suggested that cardiovascular studies relating to influenza be encouraged. On July 12, 1957, a group of medical specialists

was convened to discuss and advise regarding specific areas of research which should be supported. As the result of recommendations of this group, the council subsequently reserved \$250,000 for special research grants for cardiovascular-renal studies of influenza and approved the establishment of a four-member Ad Hoc Committee on Influenza Studies under the chairmanship of Dr. George E. Burch, to stimulate, review, and make recommendations regarding grant requests.

This committee has recommended and the council has approved 6 research grants, 2 with supplements, in the prescribed subject area, committing \$70,840.

NIMH Projects

The National Institute of Mental Health has joined with the Health Emergency Planning Unit of the Office of the Surgeon General, the Division of General Health Services of the Bureau of State Services, and the Army Chemical Corps in a cooperative study of the impact of influenza epidemics on community life.

The mental health and health educational authorities are interested in ascertaining group behavior, panic reactions, individual and mass motivations in the face of severe epidemics, and the capability under these conditions of the local government and voluntary groups of adapting their activities to cope effectively with the situation. The emergency planners want to determine the special health needs which must be met during unsuppressed outbreaks of disease, and the Army Chemical Corps is interested in ascertaining the levels of disability and absenteeism at which essential community services fail.

It is planned to hold periodic interviews with members of randomized samples of households in 3 cities of about 50,000 population in Pennsylvania and 2 more in North Carolina. Initial baseline data have already been obtained. Special contacts will be maintained with community health personnel, including physicians, nurses, and pharmacists as well as local health department representatives. The study will include similar consideration of transportation, communication, police and fire protection, school and industrial absenteeism, industrial

productivity and costs during epidemic conditions, accident rates and other circumstances and events reflective of the stresses, failures, and compensatory counteractions which occur during epidemics.

The National Institute of Mental Health has made a grant of \$50,000 to a professional information-collecting agency which is conducting the weekly family interviews. Another \$50,000 has been contributed by the Army Chemical Corps to help defray the costs of this research. Professional skills and services valued at \$35,000 are being supplied by the Bureau of State Services for the direction, coordination, and analysis of this study.

Study of Vaccination Results

From September 3 to October 26, the Employee Health Service Branch at the Clinical Center of the National Institutes of Health offered Asian strain influenza vaccine to employees of the Institutes desiring vaccination.

Careful individual records have been maintained of the manufacturer, lot number, and concentration of the vaccine administered to each person. From subsequent reports of reactions, absenteeism, and the occurrence of influenza-like illness, it is hoped that information will be obtained on the frequency and severity of reactions and the relative effectiveness of the two concentrations of the vaccine in preventing lost work days due to influenza.

Some 6,000 adults of both sexes are involved, about 4,000 of whom were vaccinated subcutaneously at the Employee Health Service with material containing 200 or 500 CCA units. The nonvaccinated group is being sampled to determine the proportion vaccinated outside the clinical center. If this number is sizable, a survey will be made to separate the vaccinated from the nonvaccinated employees.

NINDB Projects

Knowledge of the well-established etiological role of certain filtrable agents, such as rubella and salivary gland virus, in congenital defects and abnormalities, led the National Institute of Neurological Diseases and Blindness to consider supporting extramural studies to determine whether or not influenza virus also may

cause prenatal anomalies, especially of a neuropathic type. On November 16, 1957, a meeting of advisers was held at the National Institutes of Health to discuss plans and procedures for testing this hypothesis.

The group recommended that pregnancies be followed at large obstetrical services to find out whether prenatal abnormality rates were significantly higher if influenza occurred during pregnancy, especially in the first trimester. It was assumed that evidence of prenatal abnormality, including abortion, stillbirth, and fetal and neonatal malformations and anomalies, would be provided by the attending obstetricians, pathologists, and pediatricians. It was concluded that diagnoses of influenza could be made satisfactorily on the basis of standardized serologic tests supported by clinical evidence and certain knowledge that influenza was epidemic in the community when the respiratory illness occurred. The group advised that serum specimens be obtained from the pregnant women at least at registration or the first prenatal visit, at delivery, and, desirably, shortly after convalescence from any upper respiratory episode with fever. Conclusions regarding valid associations of influenza and prenatal anomalies would be based on carefully controlled statistical correlations.

In order to simplify and expedite supplementary financing for this study, it was agreed that these observations should be made, as far as feasible, at the five hospitals where NINDB cerebral palsy project collaborative studies are being made. Other institutions may be invited to cooperate later if additional data are required. The institute will act as the collecting and coordinating agency in handling and analyzing the pooled data.

Support of these studies is expected to be by contract during the initial phase of the project, later by research grants if feasible and indicated. Initiating expenses will probably not exceed \$50,000. A large proportion of the total costs will be borne by the cerebral palsy project, of which these investigations are an integral part.

Research Committee Contributions

The Public Health Service Influenza Research Committee was established on September

26, 1957, in response to a recommendation made to the Surgeon General by the State and Territorial health officers at the special conference on influenza held August 27-28. The committee chairman is Dr. Colin M. MacLeod and there are 14 members. The purposes of this committee are (a) to review influenza research conducted or supported by the Public Health Service and other Federal organizations, (b) to identify areas where current research on influenza is lacking or deficient, and to make recommendations regarding more adequate coverage, and (c) to act in a liaison capacity between influenza research workers in or supported by the Public Health Service and those in or supported by other Federal agencies.

At its first meeting, held September 27, 1957, the committee heard and discussed detailed reports of various representatives of groups engaged in or planning research on influenza in 1957-58. On the basis of these presentations, the committee was able to identify areas of subjects in which more work should be undertaken. These included (a) the standardization of hemagglutination inhibition test reporting and methods of determining CCA values of vaccine, (b) assessment of the stability of Asian influenza vaccines in terms of CCA unit values, (c) animal tests for the antigenicity of these vaccines, (d) the efficacy of intracutaneous vaccination, (e) data concerning bacterial complications, especially staphylococcal, (f) clinical management of influenza patients with complicating infections or conditions, (g) controlled studies of Asian strain vaccination in patients with chronic pulmonary and cardiac diseases, (h) possible use of attenuated live virus influenza vaccines, (i) effectiveness of available vaccines in protecting against natural infection with Asian influenza virus, and (j) problems of vaccinating children against this strain of influenza.

The committee recommended that (a) the Public Health Service make adequate funds available as soon as possible to collaborating, nongovernmental laboratories for utilizing their resources in a collaborative study on epidemic influenza on a nationwide basis, (b) the National Institute of Allergy and Infectious Diseases use remaining reserved influenza research grant funds for studying staphylococcal

complications of influenza, and (c) the Communicable Disease Center supply on request information concerning laboratories in the United States willing and able to provide reference staphylococcal typing service.

A Subcommittee on Therapy and Management of Asian Influenza and Its Complications was formed with Dr. George E. Burch as chairman. This was co-sponsored by the American Medical Association through its Committee on Influenza. A meeting of the subcommittee was held in New Orleans on October 29, 1957. The extent and pattern of the epidemic and of associated mortality was reviewed. Information was presented and discussed concerning the more common clinical manifestations and serious complications. The following recommendations were made and transmitted to the Public Health Service Committee on Influenza Research:

1. High-risk influenza patients—that is, those with chronic cardiac or pulmonary disease, persons over 60, and pregnant women—should receive prompt and adequate therapy at the first sign of influenza.

2. Grants should be stimulated for controlled studies to evaluate in high-risk patients the prophylactic administration of antibiotics (erythromycin and chloramphenicol advocated) or other chemotherapeutic agents to prevent complicating bacterial pneumonia.

3. An ad hoc committee should be appointed on pneumonia and deaths associated with Asian influenza to establish standard clinical, microbiological, and pathological criteria for determining influenza association, etiology of pneumonia, and cause of death, and to compile the results of applying these criteria during the current epidemic year.

4. Numerous small clinical studies should be made of the pathological physiology, course, and management of Asian influenza.

5. Serious consideration and long-term support should be given to research on the acute infections in people of middle age or over, studies being made to determine physiological and biochemical alterations to be derived therefrom.

The committee emphasized need for thorough and early diagnostic procedures, particularly chest X-rays, in persons presenting pro-

longed and complicated courses following influenza.

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films

"For the Nation's Health"

16-mm. filmograph, color, sound, 15 minutes. 1957.

Audience: Personnel in the health, medical, and allied professions, students, parents, teachers, counselors, civic groups, and the general public.

This Public Health Service orientation film presents a panoramic view of the activities of the principal health agency of the Federal Government. Combining photographs and motion picture film, it shows the growth of the Public Health Service from its inception in 1798, with limited care of sick and stranded merchant seamen, to its farflung programs today in hospital and medical care, in medical and biological research, and in public health.

Physicians, nurses, dentists, sanitary engineers, pharmacists, veterinarians, and a host of other skilled specialists are shown at work at home and abroad.

In Public Health Service hospitals and clinics, in well-equipped laboratories, on Indian reservations and other field assignments, and on Coast Guard duty, the range and variety of the work of the Public Health Service rarely fails to arouse interest.

Public Health Service personnel have been notified that the film is available to them, principally for

training and orientation purposes, through the Communicable Disease Center, Public Health Service, 50 7th Street NE., Atlanta 5, Ga.

Others interested and Service personnel also may order the film on a short-term loan from the Surgeon General, Public Health Service (P), Washington 25, D. C. The filmograph may be purchased from Byron, Inc., 1226 Wisconsin Avenue, Washington 7, D. C. Cost of the print, \$62.07, includes reel can, shipping case, and service charge.

Backsiphonage and Cross Connections: An Introduction

35-mm. filmstrip, color, sound, 11 minutes, 75 frames, 1957.

Audience: Sanitarian trainees and other public health personnel, including food handlers, and custodial and dining car personnel.

Many plumbing systems suffer from defects in design and installation. Backsiphonage and cross connections, two such defects, are both potential sources of waterborne disease epidemics.

This series of graphics, cleared for television, illustrates the significance to public health of backsiphonage and cross connections, tells how to identify the basic causes, and shows the methods of prevention. It surveys the major situation in which the two defects occur.

This filmstrip may be obtained on loan from the Communicable Disease Center, Public Health Service, 50 7th Street NE., Atlanta 5, Ga., or

by purchase from United World Films, Inc., 1445 Park Avenue, New York 29, N. Y.

Public Health Problems In Mass Evacuation

16-mm. film, black and white, sound, 13 minutes, 462 feet. 1957.

Audience: Civil defense trainees in all phases of public health, schools, PTA groups, civic club members, and television viewers.



Mass feeding of evacuees poses serious public health problems

This motion picture showing public health problems attending the mass evacuation of an urban population emphasizes the magnitude of such problems as mass feeding, water supply, medical care, waste and sewage disposal, consequent disease outbreaks. Its objective is the motivation of discussion rather than the solving of problems.

This film may be obtained on loan from the Communicable Disease Center, Public Health Service, 50 7th Street NE., Atlanta 5, Ga., or by purchase from United World Films, Inc., 1445 Park Avenue, New York 29, N. Y.

The R. E. Dyer Lecture



Influenza

History, Epidemiology, and Speculation

RICHARD E. SHOPE, M.D.

WE ARE FACED at the moment with the most publicized influenza epidemic of all time, and there is great diversity of opinion concerning its eventual course and outcome. Some, who believe that the present outbreak is no different from those that have appeared periodically since the 1918-20 pandemic, contend that it will come and go without any serious effects and that the public is being unduly alarmed. Others feel that the present outbreak

Dr. Shope is professor and member of the Rockefeller Institute for Medical Research, New York City. With a special interest in pathology, he has made important contributions through his investigations of such subjects as swine influenza, epidemiology of virus diseases, and intermediate host systems in infectious diseases. The latest among his many honors is a 1957 Albert Lasker award, conferred on him for outstanding achievement in research on infectious diseases. Currently, Dr. Shope is also director of the Armed Forces Commission on Epidemiological Survey.

bears some of the earmarks of the epidemic illness that occurred in the spring preceding the great influenza pandemic of the autumn of 1918 and that, as such, may constitute but the first wave of a more serious type of influenza to follow. Those who consider that this speculation may have some probability believe that the time has arrived when we must attempt to determine whether our knowledge of influenza is advanced enough to permit a serious attempt at combating it or whether we are still in a phase where all we can do is conduct further studies of pandemic influenza. The latter group are of the opinion that an intensive program of widespread immunization with a vaccine containing the new influenza virus strain should be instituted with all possible promptness.

The current epidemic of Asian influenza apparently started late in February of 1957 in Kweichow Province in southwest China. It spread to Yunnan Province in early March and was fairly well distributed through China by the end of that month. It spread to various

parts of the Orient during the following 3 months and reached the United States about the middle of May.

In this country, the disease spread slowly, involving initially military establishments that had received personnel returning from the Orient. It appeared in various groups of civilians that congregated from different parts of the United States during the summer, most notably in summer camps and in a summer church conference at Grinnell, Iowa. Ill individuals returning from these meetings set up foci of infection in their home communities, and by late July and early August the disease was widely seeded throughout the United States. During the early part of the outbreak, Asian influenza showed little tendency to spread except on very close contact and tended to remain sporadic. With the beginning of autumn, the disease diffused more widely and rapidly than it had at first (1).

The symptoms shown by individuals ill with influenza, consisting of fever, depression, anorexia, and variable respiratory signs, have been relatively mild and have lasted for 2 to 5 days. There have been to date relatively few deaths attributable to Asian influenza.

Asian influenza has as its primary etiological agent a type A influenza virus which appears, on serologic grounds, to be antigenically quite different from type A influenza viruses that have prevailed in previous outbreaks, swine, A, and A' (2). It would appear from this that the world is being exposed to a virus with which it has had little or no previous experience and that, theoretically at least, we should be ripe for an extensive outbreak with the new agent.

The marked antigenic shift in the Asian virus, the deficiency of antibody against it in humans, and its relatively rapid spread and high attack rates in the Far East are features of the new virus that alarm many people. In addition, a number of the deaths that have occurred in our country have been in young adults, the age group that was hardest hit during the devastating 1918-20 outbreak. The suggestion from all this is that the current influenza virus has epidemiological and pathogenic potentials that must be taken seriously.

To lay groundwork for speculation about the possible course and outcome of the present out-

break of so-called Asian, or Far East, influenza, I should like to review briefly a little of what is known of past influenza pandemics. No one knows when pandemic influenza first appeared, although Hirsch (3) dates its initial recognition to the year 1173. Since then it has recurred at irregular intervals under various names: febris catarrhalis epidemica, tussis epidemica, and finally influenza. The most recent pandemic, that of 1918, was by far the most deadly ever experienced. During the 4 autumn months that it prevailed, it caused some 21 million deaths throughout the world. Nearly half a million of these occurred in the United States. Thus almost three times as many people died of pandemic influenza as lost their lives during the 4 years of World War I, which ended just as the 1918 pandemic was passing its peak.

I have selected three outbreaks of pandemic influenza to discuss, for comparative purposes, and to use historically in connection with my consideration of the present influenza outbreak. I have chosen one from olden days, before the speed of modern travel entered to confuse the epidemiological picture (1789), one from the beginning of the bacteriological era (1889), and one modern one (1918).

Pandemic of 1789

The 1789 outbreak of influenza as it occurred in the United States was well described by Robert Johnson in his inaugural dissertation for the degree of doctor of medicine at the University of Pennsylvania in 1793. To orient you as to the time of this influenza outbreak, it came in the year that Washington was inaugurated President, that the first Congress met in New York, and that the French Revolution began. The first steamboat did not cross the Atlantic until 1819, and the first steam train did not run until 1830. Air travel, of course, was not even dreamed of. This outbreak occurred before modern means of rapid travel were available and when a man could go no faster than his horse could gallop. Despite this, according to Johnson, the influenza of 1789 spread like wildfire. It had the usual earmarks of later pandemics, being characterized by a prostrating illness of sudden onset and a febrile course of 4 to 5 days. Recovery was followed by several weeks of per-

Pandemic and Interpandemic Influenza

The term "pandemic" is ordinarily applied to a disease affecting or attacking all or a large portion of the population of a region: a disease extensively epidemic. Nothing in the usual definition of the term implies degree of severity. However, in current influenza parlance, the word "pandemic" has acquired a connotation of severity as well as extent of distribution. In this lecture pandemic designates a severe type of influenza such as that occurring in 1889 and during the autumn of 1918. The term "interpandemic influenza" denotes the milder type occurring between the pandemics at roughly 2-year intervals or oftener.

sistent coughing and prolonged debility in some instances. The attack rate was high, and the disease affected mainly persons in middle life.

The mortality rate was low, according to Johnson, and most patients recovered unless injudiciously treated. The suggestion was apparent in Johnson's paper that the treatment might frequently be more hazardous to life than the disease itself.

Now Johnson, in his definition of influenza, characterized it, among other things, as "a disease capable of being propagated by contagion." In spite of this conception, he could not completely rationalize the speed of its dissemination on the basis of transmission by contagion alone and visualized the importance of a "vicious quality of the air."

Johnson supported his contention about the spread of influenza by citing examples from the pandemic of 1782, in which he felt transmission by contact did not play the essential role. He stated, "Influenza appeared at London between the 12th and 18th, at Oxford in the third week, and at Edinburgh on the 20th day of May." He doubted that the disease could have been transferred to these three cities in such rapid succession "by things imbued with the contagion or by persons labouring under the complaint."

Later in his thesis he wrote, "On the 2d day of May 1782, the late Admiral Kempenfelt sailed from Spithead with a squadron under

his command, of which the Goliath was one, whose crew was attacked with the influenza, on the 29th of that month: the rest were affected at different times: and so many of the men were rendered incapable of duty by this prevailing sickness, that the whole squadron was obliged to return into port about the second week in June, not having had communication with any shore, and having cruised solely between Brest and the Lizard."

Still another example was cited as follows, "About the 6th of May [in the same year 1782], Lord Howe sailed for the Dutch coast, with a large fleet under his command: all were in perfect health: towards the end of May the disorder first appeared in the Rippon, and in 2 days after in the Princess Amelia. Other ships of the same fleet were affected with it at different periods: Some indeed not until their return to Portsmouth about the second week in June. This fleet also had no communication with the shore until their return to the Downs, on their way back to Portsmouth, towards the 3d or 4th of June."

Johnson rationalized his views concerning the multiplicity of foci of origin of influenza during a pandemic by contending, "The morbid matter exciting the disease must have originated at some time and somewhere: and a cause like to that which gave rise to it in any one country, at any one point of time, might produce it in another country at the same time, under similar circumstances."

He continues, "I do not assert, nor do I wish to be understood to mean, that the influenza is not at all contagious: on the contrary, I am possessed of facts which prove in the most incontestable manner, that it may be, and often is, propagated from one person to another by means of contagion. But I mean, and the arguments which I have adduced, I trust, will warrant the conclusion, that the disease often does arise from some vicious quality of the air, or exhalation in it, as well as from a matter arising from the body of a man labouring under disease."

It is apparent that Johnson had certain difficulties in understanding and explaining the rapidity of spread of influenza. However, he did not have to make his views take into account the knowledge that influenza is an infectious

disease with a specific microbial cause, but instead could implicate various meteorologic abnormalities to explain incongruities that were beyond his comprehension.

I have gone into some detail in outlining opinions and observations concerning a pre-modern pandemic of influenza because I wanted to point out that influenza spread with unbelievable rapidity even before we had fast transportation to blame for its rapid and widespread diffusion and that, in the absence of such explanations to account for its dissemination, others, plausible at the time, were resorted to.

Pandemic of 1889-90

The first pandemic of influenza in the bacteriological era was that of 1889-90. Finkler (4) has written, ". . . this influenza epidemic broke forth from the East, and overwhelmed the world in a pandemic such as had never before been seen. The high flood of the pandemic flowed over the whole globe in the space of a few months." It started supposedly in Bukhara in Turkestan in the month of May, though influenza was also prevalent in Greenland and in Hudson Bay territory at about the same time. Influenza did not become widespread in 1889 until October, when it prevailed over most of Siberia and European Russia. There it was supposedly first confused with dengue and later referred to as Siberian fever. By November it was prevalent over most of the rest of Europe, and in December was widespread in England and America. In the United States, the disease raged for about 2 months before subsiding, and there were periodic recrudescences during the next 4 years (4, 5).

There seems to be general agreement that this pandemic had most of the characteristics of the greater one in 1918 except for its lower fatality. W. T. Vaughn (6), who studied the 1918 pandemic and thoroughly reviewed the literature dealing with that of 1889, wrote in his monograph on influenza, "The longer one studies the observations made in 1889-93, the more firmly convinced one becomes that the recent pandemic (1918) was identical with the former in practically all of its manifestations."

The main finding of value from the studies of the influenza pandemic of 1889-90 was the discovery by Pfeiffer of the so-called influenza bacillus (7). Pfeiffer believed that this organism was the cause of influenza because, according to him, it was present in all cases and not present in normal individuals unless they had recently recovered from influenza. Furthermore, it was associated with the lesions of the disease. Pfeiffer's views were widely accepted, and it is safe to say that the majority of medical people at the time believed that he had discovered the cause of influenza.

The 1889 pandemic may turn out to be of especial interest in connection with the current outbreak of influenza. Studies of the antibody content for the Far East strain of influenza virus in serum samples from persons of various ages have resulted in some very unusual and interesting findings: it has been noted that only samples from individuals 70 to 90 years old contain antibodies for this new virus (8, 9). This finding may date the time of last occurrence of a virus of the serologic type of the present Asian strains, and the age distribution comes suggestively close to placing the time in the neighborhood of the 1889 pandemic. Thus there seems to be a possibility that we are at the moment experiencing a revisitation of the 1889 pandemic strain of influenza. This is, of course, speculative.

Pandemic of 1918

During the spring of 1918 an influenza-like disease became prevalent in various parts of the world. This spring outbreak has been generally accepted as the first wave of the great 1918 pandemic. It is believed by epidemiologists to have been the immediate forerunner of the severe autumn outbreak which swept through the entire world with such deadly effect (6).

The first wave in 1918 received especial prominence in Spain, where it was said to have been sudden in its appearance and brief in its course, and to have subsided without leaving a trace. During April an illness similar to the Spanish epidemic occurred in American, British, and French troops in France, as well as in the civilian population. In England the first wave appeared in June and was composed for the

most part of mild cases (10). It affected simultaneously a large percentage of the population and showed a preference for individuals between 15 and 35 years of age. An influenza epidemic occurred also in Japan and China in the spring of 1918 (11). It was mild and was variously called "3-day fever" or "wrestler's fever," in addition to influenza. The spring wave of influenza was not highly diffusible; it reached only limited regions of Africa, largely missed South America, and affected Canada only slightly.

It is evident from accounts of the first wave that it was almost everywhere very mild so that although the morbidity was often high, sometimes amounting to 50 percent or more of the invaded population, the case fatality was exceedingly low (10). In many localities the general mortality rates were scarcely affected. In most countries the total number of persons contracting influenza seems to have been considerably smaller in the first wave than in the second.

The second wave, which proved to be extremely lethal, struck simultaneously in many parts of the world. It is generally stated to have appeared in Europe during the last week in August. In the United States it appeared first in Boston, supposedly from cases occurring on the receiving ship at Commonwealth Pier, during the last week of August also. During the next week it broke out among troops at Camp Devens in Massachusetts and sailors at the Great Lakes Naval Training Station in Illinois. Between the first and middle of September, hundreds of new foci appeared in various army camps, naval stations, and civilian communities. By the first week in October the pandemic was full blown throughout the entire world with the exception of a few islands and Australia. The height of the pandemic so far as this country is concerned was the fortnight between October 12 and 26 (6, 10).

In the second wave, although there were many cases of the same mild type as in the first, perhaps as many as 80 percent of all attacks, a different manifestation of disease became prominent. This took two forms: (a) cases which started immediately with an acute pulmonary inflammation resulting in lung edema, violet cyanosis, and death within a few days,

and (b) cases which developed on the fourth or fifth day of an ordinary influenza a definite bronchopneumonia which ran the usual course of primary bronchopneumonia of prepandemic times and was followed, accordingly, either by death or by a long convalescence (12).

Despite the fact that there was some divergence of opinion and considerable confusion concerning the epidemiological data, most epidemiologists believed that the 1918 autumn pandemic arose at 1 or 2 sites and from these spread throughout the world in a little over a month's time. It was commonly accepted, and there was evidence to support the opinion, that the pandemic in this country started in or near Boston (6, 10). The cases responsible for the infection in Boston supposedly came from Europe, where the pandemic got under way very little, if any, earlier than it did in the Boston area. The infection was said to have been spread to other parts of the United States by the movement of patients among the civilian population or by the transfer of infected military personnel from one camp to another. The speed of spread was accounted for on the basis of the speed of available transportation. Certainly in a large number of instances, cited in the literature of the times, the onset of the disease in a community or a military establishment coincided very closely with the arrival of infected individuals.

However, certain discrepancies enter to spoil the perfection of the case-to-case transfer explanation for the spread of influenza during the second wave of the 1918 pandemic. These have to do with certain flukes in distribution, certain skips of large bodies of population. For example, Boston and Bombay had their epidemic peaks in the same week, while New York, only a few hours by train from Boston, did not have its peak until 3 weeks later (10). In like manner, Seattle, Los Angeles, and San Francisco had their epidemic peaks some 2 weeks earlier than Pittsburgh, which is just an overnight run from the infected eastern seaboard cities. In some respects, the epidemiologist had an easier time getting the pandemic disease transferred over long distances than in taking it to communities nearby. Thus, though it got to Chicago, presumably from Boston, fairly early and affected that city in September, it did

not reach Joliet, just 38 miles away, until October. Similarly, it took 3 weeks to cross the little State of Connecticut from New London County to Fairfield County (10).

In the light of these various epidemiological ambiguities one cannot help wondering whether perhaps more than one mechanism of dissemination may have been operating during the 1918 pandemic to account, on the one hand, for the lightning-like spread of disease over large distances and, on the other hand, for its slower diffusion over relatively small distances. The suggestion is apparent that extensive and widespread preseeding of virus in a masked or occult form, with its almost simultaneous provocation to infectivity by a stress common to wide geographic areas, might better account for the appearance of extremely rapid dissemination over great distances than does the view that case-to-case transfer was the responsible mechanism.

In swine influenza, a disease that I shall discuss a little later, the causative virus is preseeded in a masked, noninfective form by means of an intermediate host, the swine lungworm (13). Swine preseeded in this manner with occult virus remain normal to all outward appearances. However, all that is required to bring them down with influenza is the application of some stress of itself relatively innocuous. The stress, operative in nature for swine influenza, is meteorologic in character and is associated with the onset of cold, wet, inclement weather in the autumn (14). Swine that have been preseeded with masked influenza virus come down almost simultaneously in geographically widely separated areas when subjected to the same meteorologic stress, and the resultant widespread outbreak of influenza creates the illusion of being a disease that has diffused over an extensive area with unbelievable rapidity (15). Secondary cases of swine influenza follow at a more leisurely pace as a result of case-to-case contact with the primary, provoked infections.

I do not mean to imply, of course, that during the 1918 pandemic, the swine lungworm preseeded influenza virus in the human population. What I should like to suggest, though, is that influenza virus may be capable of existing in a masked form, similar to that found in

the swine lungworm, in the human respiratory tract and that in such form it may be widely preseeded throughout a human population. It seems possible even that such preseeding may have been one of the functions of the milder, more slowly diffusing first wave of the 1918 influenza pandemic.

To return to further consideration of the 1918 pandemic, it may be said that, despite the apparent epidemiological discrepancies to which I have called attention, the opinion that direct and indirect transmission from man to man could account for the observed epidemiological picture of pandemic influenza was generally accepted. Whatever the correct explanation may be for the wide dissemination of the 1918 autumn pandemic, there is no doubt that the disease became very extensively distributed in short order. This second wave differed from the first in that it was more severe, more widespread, of greater dispersive power, and in some places at least, of a different age incidence.

The mortality rates recorded during the second wave varied widely among different groups and communities. The case fatality rate ranged from 3.1 percent in New London, Conn., to 0.8 percent in San Antonio, Tex. (16). Military personnel were especially hard hit, and Vaughn and Palmer (17) have stated that during the 4 autumn months of 1918, 1 of every 4 soldiers in the United States had influenza, 1 of every 24 developed pneumonia, and 1 of every 67 died.

Efforts to Prove Contagiousness

With all of the observed clinical and epidemiological evidence pointing to the likelihood that the 1918 pandemic influenza was highly contagious and spread from sick to well easily and apparently at the very first available opportunity, one would have anticipated that proof of its contagiousness by transmission tests in human volunteers would have been extremely easy. However, such did not prove to be the case: in not a single controlled experiment was it possible to demonstrate the transmissibility of the disease.

The most carefully planned and conducted experiments were those carried out by the Navy and the Public Health Service. In the series

of experiments conducted in Boston during November and December 1918, 62 volunteers between 15 and 34 years of age were used (18). Thirty-nine of these had no history of having had influenza at any time, although apparently some degree of exposure had occurred. Filtered and unfiltered secretions from the upper respiratory tracts of patients with typical influenza were sprayed into the nose and throat and instilled into the eyes of some of the volunteers; direct swabbing from nasopharynx to nasopharynx was the method of exposure for others; and in one experiment freshly drawn citrated blood was injected subcutaneously. The results were summarized as follows: "In only one instance was any reaction observed in which a diagnosis of influenza could not be excluded, and here a mildly inflamed throat seemed the more probable cause of the fever and other symptoms. Nothing like influenza developed in the other volunteers."

In an attempt to imitate nature more closely, 10 volunteers were exposed to patients with acute influenza in hospital wards. Each volunteer was placed very near the patient, shook hands with him, chatted with him for 5 minutes, and then received the patient's breath full in his face five times while he inhaled. Finally the patient coughed five times directly in the subject's face. Each volunteer did this with each of 10 different patients, all of them acutely ill for not more than 3 days. All patients used had typical acute cases selected from a distinct focus or outbreak of disease. None of the volunteers developed the disease.

A second series of similar experiments was carried out in San Francisco during the same period also with completely negative results (19).

These two groups of experiments were considered to show that the requirements for the transmission of influenza from man to man, such as apparently exist commonly under natural conditions, are not readily imitated experimentally. Actually they constituted probably a very good demonstration of how solid an immunity was conferred by even a subclinical bout with the etiological agent of the 1918 influenza.

Much work was expended during the 1918 pandemic in an effort to determine the causative agent of the outbreak. Prior to the 1918

studies, *Hemophilus influenzae* had been generally regarded as the agent responsible for influenza. It seems quite natural, therefore, that much of the 1918 investigative work should have been concerned with a further study of the relationship of this bacterium to the disease. The results obtained were frequently confusing and contradictory, which is not surprising in view of the fastidious character of the organism and the technical difficulties associated with its isolation from the respiratory tract. It is difficult to give an accurate appraisal of the significance of the large amount of work done during the 1918 pandemic in trying to prove or disprove the etiological relationship of the Pfeiffer bacillus to influenza. About all that can be said is that the role of the organism was more controversial after the smoke of the 1918 pandemic studies had cleared than it had been before.

With the failure to gain clear-cut evidence that *H. influenzae* was the cause of the 1918 pandemic, the view was rather widely held and was frequently expressed that a virus was probably the etiological basis for the disease. This actually constituted no more than an ungrounded opinion, for consideration of the data on the subject published from 1918 investigations reveals that no one adduced good evidence to incriminate a virus as the causative agent. The upshot of a terrific amount of effort during the 1918 influenza pandemic to learn the cause of the disease was to weaken the view that Pfeiffer's bacillus was the etiological agent and to substitute no other in its place.

I have just indicated that no one succeeded in determining the causative agent responsible for the 1918 pandemic influenza. This is not strictly true and what I should have said is that no investigator working in a laboratory did it. Actually Mother Nature stepped in and took care of the situation for us, as I shall now point out.

Swine Influenza

At the height of the second wave of the 1918 pandemic, a new disease appeared among swine in the Middle West. This new disease was not a sporadic and localized outbreak; actually millions of swine became ill and thousands died

during the first few months of its occurrence. The epizootic persisted in various localities until January 1919 and reappeared in the autumn and winter of that year as extensive and severe as in 1918. It has recurred each year since then, but it varies annually in its severity and extent.

Dr. J. S. Koen, an inspector in the Division of Hog Cholera Control of the U. S. Bureau of Animal Industry, was the first to recognize that the disease was different from any previously encountered (20). He was so much impressed by the coincidental prevalence of human influenza and by the resemblance of the signs and symptoms seen in man to those occurring in hogs that he became convinced that the two were actually the same. He therefore gave the name of "flu" to this new disease of hogs. The opinion of Koen that "flu" represented an entirely new swine epizootic disease and that swine might have been infected in the first instance from man was shared by some veterinarians and many farmers in the Middle West (21).

Everything was not rosy, however, with Koen's contention that a direct causal relationship might exist between the swine and the human diseases. The basis for the objections was largely economic since it was feared that, if it became widely known that swine could acquire human influenza, the pork-consuming public might become alarmed and the pork market would be adversely affected. Koen, however, was a fiery little man and, though frequently forced to defend his convictions verbally, stuck to them steadfastly. A year after his choice of what seemed a most unpopular name and diagnosis, he defended himself as follows (22):

"I have no apologies to offer for my diagnosis of 'flu.' Last fall and winter we were confronted with a new condition, if not a new disease. I believe I have as much to support this diagnosis in pigs as the physicians have to support a similar diagnosis in man. The similarity of the epidemic among people and the epizootic among pigs was so close, the reports so frequent, that an outbreak in the family would be followed immediately by an outbreak among the hogs, and vice versa, as to present a most striking coincidence, if not suggesting a close

relation between the two conditions. It looked like 'flu,' it presented the identical symptoms of 'flu,' and until proved it was not 'flu' I shall stand by that diagnosis."

The late Dr. Paul A. Lewis and I began our studies of swine influenza during the autumn of 1928, and we were elated and pleased when we isolated from our very first cases of the disease an organism that was, so far as we could tell, like the non-indol-producing strains of Pfeiffer's bacillus (23). We named this organism *Hemophilus influenzae suis*. We isolated the same organism from field outbreaks of swine influenza again in 1929 and in 1930. It was the only organism we found with any regularity, and sometimes it was the only one present in the respiratory tracts of sick swine. Unfortunately, so far as assigning it etiological importance was concerned, *H. influenzae suis* administered in pure culture to susceptible swine produced no illness. We were thus faced with the dilemma of having found an organism that seemed always to be present in cases of the disease, that was demonstrable at the sites of the influenza lesions in the respiratory tract, but that failed to induce disease when administered to normal swine.

It was subsequently found that a filtrable virus, differing from any hitherto known, was important in the causation of swine influenza (24). This virus, however, was not the sole cause of swine influenza: when the virus was administered alone to susceptible swine it produced a disease that was clinically much milder than the true swine influenza as seen under natural conditions.

It was finally determined that swine influenza was a disease of complex etiology and that both the bacterium *H. influenzae suis* and the new filtrable virus were etiologically essential (24). We thus had in swine influenza a disease caused by the concerted activity of two agents, one of which, the bacterium, was strikingly like Pfeiffer's bacillus, long suspected by many of playing a causative role in human influenza. The other agent etiologically essential was completely new and did not, so far as anyone knew at the time of its discovery, have a counterpart in human disease. As it later developed, however, when Smith, Andrewes, and Laidlaw (25) demonstrated a virus as the cause of an in-

fluenza outbreak in 1933 and when this new virus was compared with the one from swine influenza, the two were found to be strikingly alike. They affected the same species of animals; they gave a high degree of cross protection against each other; and they could only certainly be differentiated from one another on the basis of certain serologic tests (26-29).

Thus in 1933 we had for consideration the intriguing situation of an animal disease of complex etiology, resembling influenza, in which one of the essential agents resembled the bacterium found extensively present in the second wave of the 1918 influenza pandemic and in which the other essential agent resembled the virus responsible for the then current inter-pandemic influenza. It seemed that, despite the failure of human investigators of the 1918 influenza pandemic to discover the cause of the outbreak, Mother Nature, using swine as her experimental animals, had done so. Furthermore, she had apparently segregated not one human agent but two from the disease of the severe second wave.

The late Sir Patrick Laidlaw (30) and I (31) summarized the indirect historical and experimental evidence bearing on the relationship of swine influenza to pandemic human influenza and pointed out that it strongly indicated the likelihood that swine had indeed acquired their infection naturally from man in 1918 and that the swine influenza virus was, therefore, the surviving prototype of the 1918 pandemic virus. Two further bits of experimental evidence have subsequently been developed in support of the hypothesis. In serologic tests conducted against swine influenza virus with serum samples from humans of various ages in 1935 and 1936, the results were such as to indicate strongly that an agent of the swine influenza virus type had been widely prevalent in man in the period from 1918 to 1920 and had not been present since then (32, 33). In like manner, serologic tests conducted in 1952 (34) with swine influenza virus and the serums of humans of various ages again pinpointed the time of prevalence of an agent of the swine influenza virus type to the 1918-20 period. These two sets of studies, one carried out 17 years and the other 34 years after the 1918 pandemic, both orienting the time of prevalence of a virus of the swine influenza

type to the period 1918-20, would seem rather effectively to support the view that swine influenza represents the surviving prototype of the agent that prevailed in man during the second wave of the 1918 influenza pandemic.

In brief, it seems to me that, from the swine influenza findings, one is warranted in speculating that the second wave of the 1918 influenza pandemic had as one of its etiological components a virus that was serologically closely related or identical to the swine influenza virus. It was, therefore, a type A virus not too much unlike the type A viruses with which we have had experience in the influenza outbreaks since 1933.

I am further going to assume for speculative purposes that the etiology of swine influenza as we know it today represents accurately the etiology of the second wave of the 1918 pandemic and that back in the autumn of 1918, when swine acquired their disease from man, the pigs effectively segregated the important etiological components of the human disease, namely, Pfeiffer's *H. influenzae* and a type A influenza virus. I hope that you will not consider this last assumption too illogical because to me it appears completely reasonable that, if an experimental host can select the etiologically essential virus, it might equally well be expected to select, from the mixture of micro-organisms that prevailed during the second wave of the 1918 outbreak, the etiologically important bacterium.

Evidence of Immunity

A question of very great interest to us right now, when we are in the midst of an outbreak of mild influenza which may turn out to be the first wave of a more severe outbreak, is what constituted the difference between the mild first wave and the severe second wave of the 1918 pandemic. I have speculated, on the basis of the swine influenza work just discussed, that the second wave of the 1918 pandemic was caused by a type A influenza virus, of which the swine influenza virus is the surviving prototype, acting in concert with *H. influenzae*. What then caused the first wave, and why was the first wave so much milder than the second one? Are there any data

from the investigative work conducted during the 1918 outbreak that might shed light on the relationship of the one wave to the other? I believe that there are and that they concern the question of immunity conferred by an attack of influenza during the first wave against infection during the second.

Because this question of the presence or absence of an immunological relationship between the first and second waves of the 1918 influenza has an important bearing on my speculations, I should like to cite several examples dealing with this point.

The Annual Report of the Surgeon General of the Navy for the year 1919 says in part, "... many men of the Navy who had influenza in the spring or summer of 1918, while in European waters, escaped during the later epidemics (winter 1918-19) both in Europe and the United States. The British Grand Fleet experienced the same thing: with few exceptions those men who contracted influenza in May and June were not attacked during the more fatal epidemics in October, November, and December. The conclusion is that mild attacks earlier in the year, as a rule, conferred immunity against the more fatal type of the disease which prevailed subsequently." With regard to the experience in the British Navy, Dudley (35) has pointed out that the crews of only certain ships were affected by the first wave, the crews of others escaping the infection. During the second wave the attack rate on the ships that had had the earlier infection was about 25 percent, while on those ships that escaped the first wave the attack rate was about 50 percent.

In most Army groups the outfits were moved about too much and transferred too frequently to furnish reliable records as to an immunological relationship between the two influenza waves in 1918. There are, however, large numbers of isolated records involving relatively small numbers of individuals. For instance, Gibbon (36) writes that of 400 patients with influenza hospitalized from among the 2,000 troops under his care, none admitted in June, July, or August was readmitted in October, November, or December, and none admitted in either of those periods was readmitted in February 1919. Dopter (37) reports

recurrent epidemics in a French Army division of which he was surgeon in 1918. During the spring wave, toward the end of April, only the infantry regiment of the division was attacked, the artillery regiment escaping infection. In the fall a group of heavy artillery was attached to the division, bringing influenza with it. The disease spread, but only those not ill during the first wave were very seriously ill in the second.

V. C. Vaughn (38) cites the experiences of the 2d Infantry Regiment which underwent influenza in June of 1918 in Hawaii before being transferred to Camp Dodge about August 1. When the severe second wave hit Camp Dodge in September and October, the 2d Regiment was only slightly affected, although the attack rate for the camp as a whole was about 33 percent and the case fatality 6.8 percent.

Probably the most impressive example of immunity among troops is that related by V. C. Vaughn (39) for a division stationed at Camp Shelby. The division, numbering about 26,000, underwent a mild influenza epidemic of about 2,000 cases in April 1918. Vaughn comments as follows on the subsequent history of the division: "This was the only division that remained in this country without change of station from April until the fall of 1918. During the summer this camp received 20,000 recruits. In October 1918 the virulent form of influenza struck this camp. It confined itself almost exclusively to the recruits of the summer and scarcely touched the men who had lived through the epidemic of April. Not only the 2,000 who had had the disease in April, but the 24,000 who apparently were not affected escaped the fall epidemic. It appears from this that the mild influenza of April gave a marked degree of immunity against the virulent form in October."

Certain information about the civilian population also indicated an immunological relationship between the first and second waves of influenza. Maloué and McKendrick (40) observed in Calcutta that three institutional populations who experienced infection during the July wave passed through two later waves, in December 1918 and February 1919, without contracting the disease a second time. They believed that their evidence indicated an im-

munity lasting for at least 9 months. The Inspector General of Health in Spain (cited by W. T. Vaughn, reference 6) reported that those cities that had the disease in May 1918 suffered lightly in the autumn, while cities that had been spared in the first invasion suffered most in the second. V. C. Vaughn (39) has pointed out that among the large cities in the United States having a low death rate during the autumn wave of influenza were a number that had reported an unusually high incidence of influenza and pneumonia in the spring. Jordan (10) has called attention to the fact that the attack rates in English towns during the autumn wave were only about half those prevailing in towns in the United States and comments on the temptation to account for the differences on the basis of the more sharply defined and extensive first wave which prevailed in England having conferred a more extensive immunity. W. T. Vaughn (6) in studies deriving from his house-to-house canvasses in Boston found only four instances of more than one attack of influenza among 1,971 cases occurring in his series between March 1918 and August 1919.

There are, of course, some examples in the literature which fail to show a clear-cut immunological relationship between the two waves. My reason for calling detailed attention to the examples indicating a relationship and neglecting those that do not is this: When one is seeking to show a positive relationship between two conditions of unknown etiology, a positive correlation is, because of diagnostic uncertainties, of much more value in indicating the true relationship than is a negative one.

It is apparent, I believe, from the examples I have just cited that, by and large, an attack of influenza during the mild first wave protected an individual against infection during the more severe second wave. Such a relationship strongly suggests that the etiological agents responsible for the two waves were either identical or so closely related immunologically as to cross-protect one against the other. Since what presumptive evidence we have indicates that a type A influenza virus of the swine influenza prototype was involved in the second wave during 1918, the assumption seems warranted from this immunological data that the

same or a very closely related type A virus was also involved in the first wave. Why then, since similar influenza viruses were apparently of etiological importance in each of the waves, were the two waves clinically so different?

Role of *H. Influenzae*

A possible answer to this question, I believe, is supplied by the bacteriological studies of those investigators who sought to find the Pfeiffer bacillus during both waves of the 1918 pandemic. As I have pointed out, from the time of Pfeiffer's announcement of its discovery in 1892 until 1918, *H. influenzae* was generally regarded as the agent responsible for epidemic influenza. Because of this belief, much of the work done during the 1918 pandemic was concerned with a further study of the relationship of this bacterium to the disease.

In the light of this large effort to find *H. influenzae*, the marked difference encountered in the incidence in which it was demonstrated during the first and second waves by individual investigators who studied both waves was striking and suggestive. The findings of almost all were in agreement that the Pfeiffer bacillus was either absent or of low incidence in cases of the first wave and abundantly present during the second wave. Sobernheim and Novakovic (41), for instance, found Pfeiffer's bacillus to be practically absent from the early cases, whereas in the second wave they found it in pure culture in a large majority of the cases investigated (18 out of 23). Fildes, Baker, and Thompson (42) failed to find influenza bacilli in cases during July and August but found them during the autumn wave in the sputum of 12 of 15 uncomplicated cases and in practically all their postmortem material. Similarly, McIntosh (43) failed in the summer but found Pfeiffer's bacillus in the autumn in 8 of 12 examinations of the nasopharynx in uncomplicated cases, and in the sputum of 21 of 25 cases with bronchopneumonia. The experience of others both in Europe and in the United States was similar (44-47).

In this country, for example, Opie, Blake, Small, and Rivers (47) found that the incidence of Pfeiffer's bacillus in normal individuals from isolated communities, or in groups free from respiratory disease prior to the occur-

rence of the 1918 autumn epidemic, was relatively low (10 to 20 percent), but that before the fall epidemic, in groups in which bronchitis and pneumonia were fairly prevalent, the incidence was higher (25 to 50 percent). During the epidemic the incidence rose to 95 percent.

I believe it can be safely said that, so far as the bacteriology of the first wave of the 1918 influenza epidemic can be used as a criterion, Pfeiffer's bacillus was not demonstrated with enough frequency to support its claim as a causative agent. Its presence probably about coincided with its distribution in healthy persons at the time that the first wave appeared. During the second wave, however, the organism appears to have been found with great regularity.

In summary then, it appears that the Pfeiffer bacillus was absent or of low incidence in cases of the first wave and was almost uniformly present in cases of the second wave. How then could these differences in the bacterial flora during the two waves have influenced the severity of a disease caused by a type A influenza virus? Here I must again revert to consideration of swine influenza for a possible answer to this question.

As I have indicated earlier, infection of swine with the swine influenza virus alone results in an extremely mild respiratory disease of 2 or 3 days' duration from which the animals uniformly recover. However, swine infected with the swine influenza virus in combination with *H. influenzae suis* undergo a severe prostrating, febrile illness of 4 or 5 days' duration, frequently accompanied by pneumonia, from which death results in about 3 percent of all cases. In swine, then, the disease caused by the swine influenza virus alone resembles, in its mildness and other clinical characteristics, that seen in man during the first wave of the 1918 influenza, while the disease caused by a concomitant infection with the virus and *H. influenzae suis* resembles that seen during the second wave of the 1918 influenza. Furthermore, swine recovered from the mild ailment caused by infection with the virus alone are solidly immune to the more serious disease caused by infection with the virus plus *H. influenzae suis* (48).

It seems apparent, if the analogy between swine influenza and the 1918 influenza pandemic is an acceptable one, that the mild first wave of the 1918 pandemic can then be interpreted as one in which only a type A virus of the swine influenza prototype was involved. The second wave, on the other hand, was one in which the infection was a complex one, involving the same or an immunologically closely related type A virus and *H. influenzae*.

Applications to Present Outbreak

Let us now return to the current Asian influenza outbreak. If this outbreak is eventually to reach serious proportions, we appear at the moment to be in what in 1918 was the first wave. The cases ordinarily are not severe, and the mortality rate is relatively low. So far as I am aware, the Pfeiffer bacillus is not being isolated with any regularity from cases, and certainly it has not been reported to have been present in cases that have come to autopsy.

The current influenza may be considered on clinical grounds to be similar to a number of the outbreaks of interpandemic influenza that we have experienced since 1932 or to the first wave of the 1918 pandemic. We have no way of knowing at the moment whether it will be followed by a second wave of greater pathogenicity, as was the first wave in 1918. The fact that the human population is, in this outbreak, experiencing infection with a virus with which it has had no previous experience, to judge from the absence of specific antibodies, suggests that we may be ripe for a continuation of the present epidemic into a severe and killing second wave, but I do not think that anyone is, at the moment, in a position to predict accurately on this point.

Now, in the light of the speculations in which I have indulged, I should like to outline briefly my views as to how the present outbreak should be handled from a practical standpoint.

I believe it would be very foolish not to take full advantage of what means we have to protect ourselves. By this I mean that vaccination against the current epidemic strain seems to me to be strongly indicated. I think it is especially urgent that those who have apparently missed clinical infection during the early part of the present outbreak be immunized, since

they may be the very ones in whom occult virus has been preseeded. We have waited a long time to learn whether, when the next pandemic came along, we would be in a position to combat it, or only in a position to study pandemic influenza further. If we do not vaccinate widely and effectively and a second wave of severe influenza should appear, then undoubtedly we shall have copious opportunity again to study pandemic influenza. If we do vaccinate now, the most valuable information that can be derived will be whether or not we have finally gotten ourselves into a situation where we know that we can protect against outbreaks of pandemic influenza.

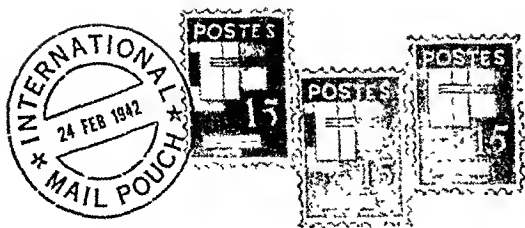
One frequently hears the view expressed that if another pandemic of severe and killing influenza occurs, the antibiotics can handle the situation satisfactorily by taking care of the lethal secondary bacterial invaders. Now this may be quite true for most of the commonly thought of complicating organisms. However, if *H. influenzae* should happen to be of importance, I doubt that we as yet have sufficient experience in treating infections of this organism in adults to be certain on this point. Although chloramphenicol, streptomycin, and the tetracycline antibiotics have been effective in *H. influenzae* infections in children, it seems to me that we are at the moment too deficient in accurate information to predict just how effective these antibiotics would be in treating adults, especially in the event that the hemophilus was acting concomitantly with influenza virus. In the light of such possible therapeutic uncertainties, I feel that primary reliance for protection against pandemic influenza should be placed on preventive rather than therapeutic procedures.

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Milestone

All 70 sanitary inspectors of Costa Rica's Ministry of Public Health, studying in 3 groups, completed a 7-month course of classroom instruction and field demonstration introduced November 1954. Spanish language resumés of the various subjects, developed by Alberto Grego, sanitarian, helped make the training one of the more successful projects of the Cooperative Public Health Servicio.

The best three students from each group were sent to Puerto Rico for training in supervision. They will become a nucleus of supervisors to strengthen and improve the service of the section of sanitary inspection.

—CHARLES S. PINEO, *chief, health, welfare and housing field party, U. S. Operations Mission, Costa Rica.*

15th Anniversary

Serviço Especial de Saúde Pública completed 15 years of public health work in Brazil last July. Wherever SESP operates, festivities, speeches, and exhibits marked the anniversary of this cooperative health program.

Begun as emergency health work in the Amazon Valley supporting production of strategic materials during World War II, SESP has now spread over the entire country, operating in 461 localities. It is best known for its community health programs and water supply work.

About 1 million people a year receive some kind of direct service at SESP health units and at least another million are reached by home visitors, sanitary inspectors, and health educators. Eleven regional offices throughout the country direct the program of medical care, maternal and child health service, and environmental sanitation.

Five hundred water supply projects are already operating or under construction or being designed. A result of these projects, according to Professor

Herbert M. Bosch: "The development, largely through SESP efforts, of a full-time sanitary engineering specialty in Brazil over a period of 15 years is, I believe, without precedent in the world."

SESP is presently strengthening state and local government agencies to carry out health and sanitation work delegated to them by Brazil's constitution.

—E. ROSS JENNEY, M.D., *chief, Health and Sanitation Division, U. S. Operations Mission, Brazil.*

Earthquake in Ardestan

A woman sat on a mound of rubble that had once been her home, guarding her pots and pans and refusing to move. Then the Iranian nurse spoke to her gently and the gendarme led her away. A wall fell on a man while he slept in bed. A woman and her four children were found under the rubble in a home.

They were victims of an earthquake in Ardestan, Iran, last April. In 1 of the 7 villages hit, more than 250 houses were destroyed or damaged beyond occupancy. The disaster taxed the public health services staff but they worked tirelessly.

The injured were in a temporary hospital building. There nurses removed cotton placed over dirty wounds, cleaned them, and put on fresh dressings. A woman with bilateral leg fractures was taken by gendarme ambulance to Isfahan.

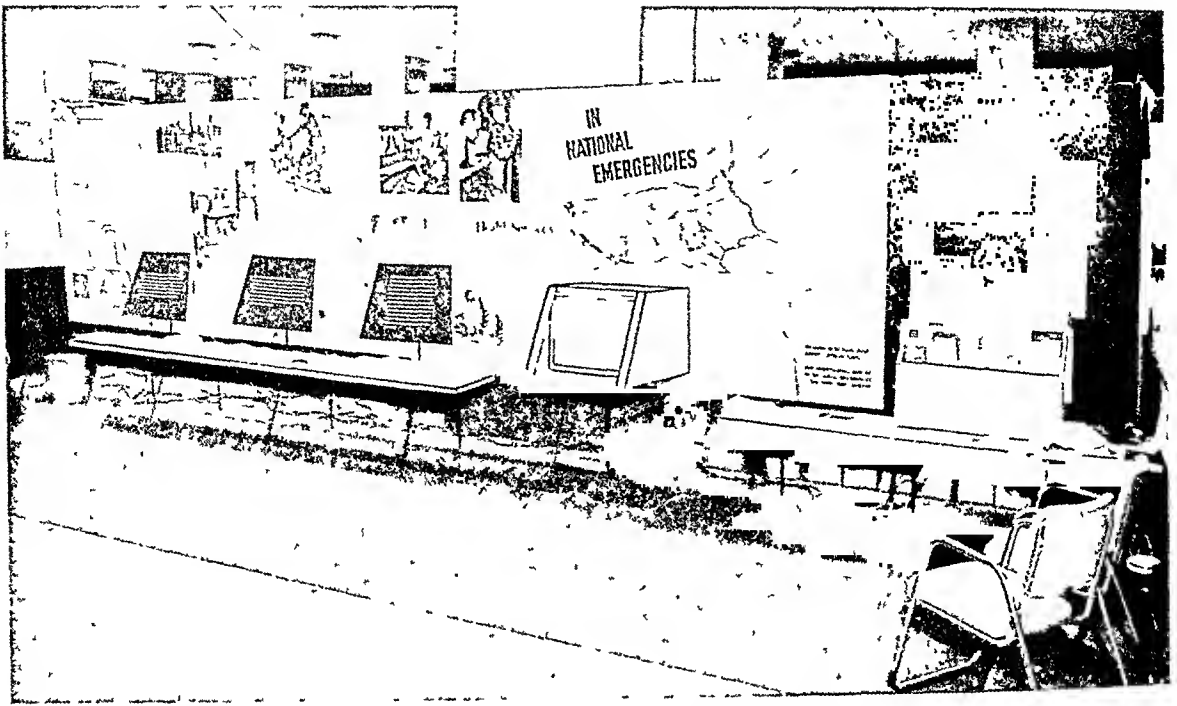
At the quake site, public health workers pitched a tent, set up priorities for treatment, and gave medical care. Patients swarmed in with ailments ranging from worms to skin diseases.

—GLEN W. McDONALD, M.D., M.P.H., *chief, Public Health Division, U. S. Operations Mission, Iran.*

Vanishing Yaws

Inspectors making their 11th house-to-house survey in the province of Esmeraldas, Ecuador, found yaws disappearing. Esmeraldas, a town of 20,000, had only 5 cases, 2 of them relapses, and Quindindé, with a population of 1,100 yielded only 6 cases, 5 of them relapses. Activities were intensified to find and treat all residual cases. The inaccessibility of isolated communities in northwest Ecuador makes this the most difficult phase of the anti-yaws campaign.

—JAMES D. CALDWELL, *chief, health, welfare and housing field party, U. S. Operations Mission, Ecuador.*



Opportunities in the United States Public Health Service, a 27-foot floor model, is one of the first Public Health Service exhibits under the expanded recruitment program. It won a Certificate of Merit from the Committee on Scientific Exhibits during

the 1955 meeting of the American Public Health Association. The box protruding from the center surface of the exhibit contains a motion picture projector for continuous showing of the recruitment filmograph "Service With Distinction."

Visual Aids for PHS Recruitment

At a time when the Nation is experiencing a shortage of qualified technical, professional, and scientific personnel, the Public Health Service, principally through its Division of Personnel, is developing and expanding a recruitment program for commissioned and civil service personnel to meet its own needs for specialists. Filmographs and exhibits produced by the Service are described here as examples of the types of materials being developed for the recruitment program.

FILMOGRAPHS

A black and white, 16-mm. filmograph, produced primarily to recruit professional and technical personnel for the Public Health Service Commissioned Corps, is being revised and converted to color and will be

ready by next spring. It bears the title "Service with Distinction" and was described in the July 1956 issue of *Public Health Reports*, shortly after it was originally produced. The black-and-white version has been shown to numerous health, medical, and nursing groups, as well as lay organizations, universities, and professional schools, throughout the country in the past 2 years. It is available, in black and white, also as a filmstrip, accompanied by recorded narration and music.

A 16-mm. filmograph in color, entitled "For the Nation's Health," was released recently by the Service. Although produced primarily for the orientation of Service employees, "For the Nation's Health" will be of interest also to health and medical personnel, students in professional schools, parents, teachers,

counselors, and community groups. It describes the origin, growth, organization, and work of the Service in nontechnical terms and provides the viewer with a clear understanding of the scope of its work. (See film announcement on page 164.)

Also new is the Service's nurse recruitment filmograph "Anyone For Nursing?" a 16 mm. production in color that is directed toward the recruitment of nurses in some of the Service's more interesting and challenging programs. Paced with sprightly music and humorous cartoons, it takes the viewer on a tour of the Public Health Service programs in which nurses are most active. These include the Public Health Service hospitals throughout the country, the clinical research programs of the National Institutes of Health, the Indian health pro-

PARTNERS IN SERVICE

*Technical
Skills
Lived*

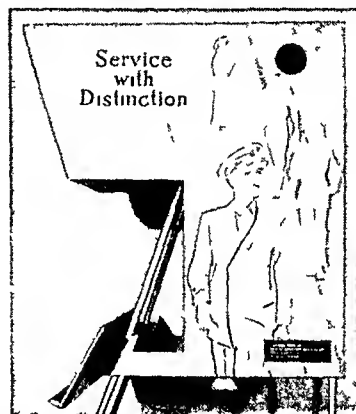
SERVICE WITH DISTINCTION

PMS FACILITIES IN THE U.S.

PMS ACTIVITIES OUTSIDE THE UNITED STATES

OPPORTUNITIES FOR PROFESSIONAL DEVELOPMENT

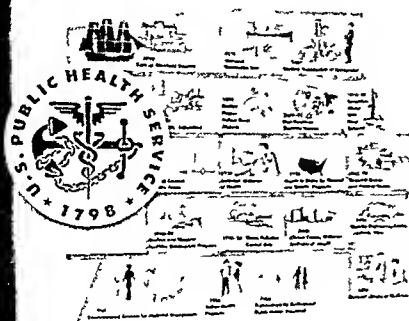
Service With Distinction, a new series of recruitment exhibits, includes a 17-foot floor model (above), a mounted projection box containing a motion picture projector for continuous showing of films (right), and a 7-foot table-top display (below). Other exhibits with the same theme (not illustrated) are a 9-foot combination floor and table-top exhibit made of aluminum with detachable legs and a 12-foot floor model composed of four aluminum panels, colorfully designed and well illuminated.



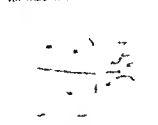
SERVICE WITH DISTINCTION

U.S. SERVICE

Opportunities
for
professional
development



PMS FACILITIES IN THE UNITED STATES



PMS ACTIVITIES OUTSIDE THE UNITED STATES

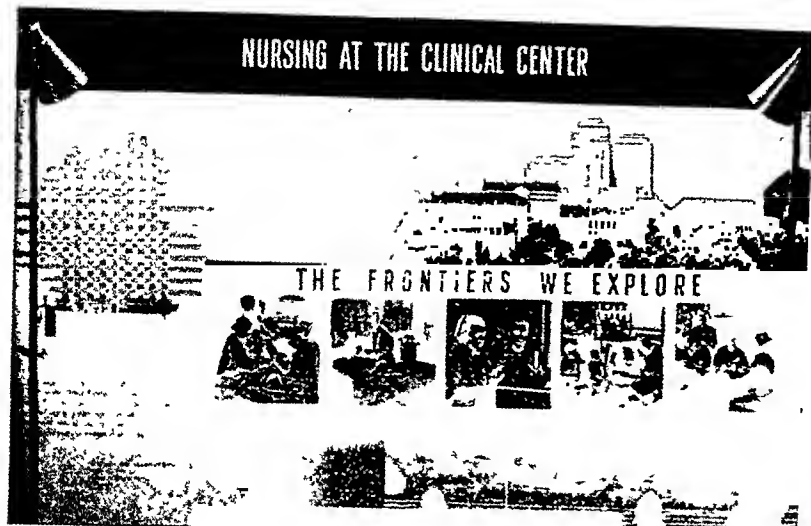


partners in service

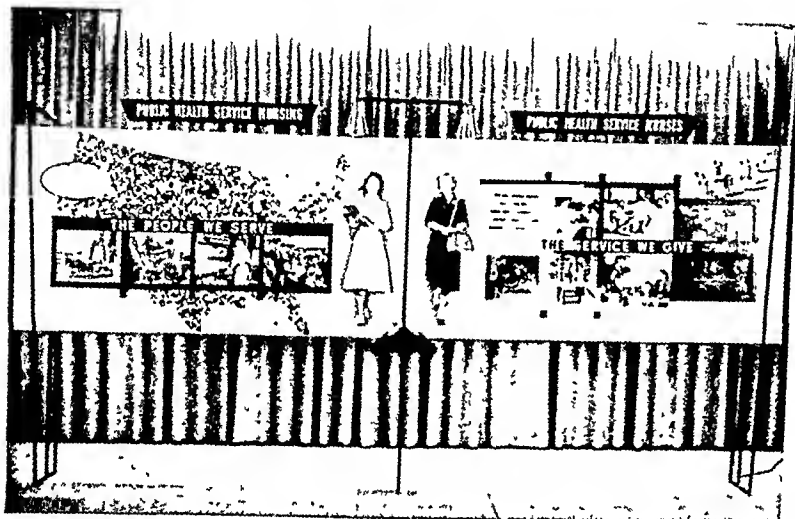


The **U.S. PUBLIC HEALTH SERVICE**
for service in
NATIONAL EMERGENCIES

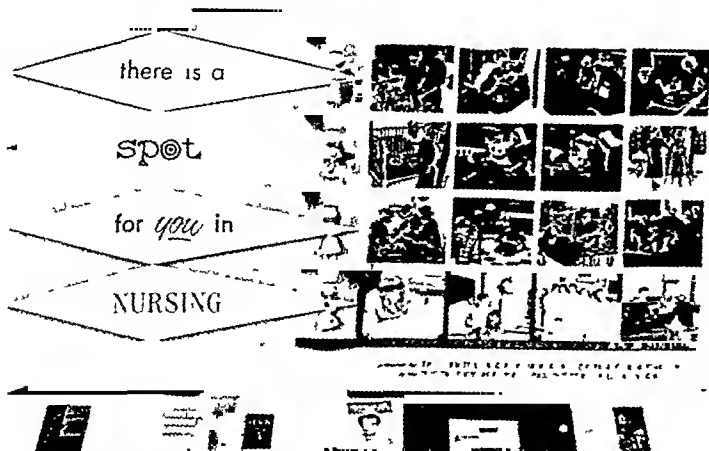
The U.S. Public Health Service is a branch of the Department of Health, Education and Welfare. It is a federal agency that provides medical and health services to the people of the United States. The Service is composed of several branches, including the Bureau of Preventive Medicine, the Bureau of Communicable Diseases, the Bureau of Laboratories, the Bureau of Epidemiology and Prevention, the Bureau of Health Statistics, and the Bureau of Health Services Administration. The Service is also responsible for the training and supervision of public health personnel. The Service is a vital part of the nation's health care system and is committed to the improvement of the health of the American people.



The Frontiers We Explore



The People We Serve . . . The Service We Give



There's a Spot for You in Nursing

gram in this country and Alaska, public health nursing activities, and the overseas health missions. Nurses are shown at work in the West, in the frontier environment of the sub-Arctic, and in foreign lands. (See film announcement in January 1958 issue, page 7.)

GENERAL EXHIBITS

Among the first recruitment exhibits produced by the Division of Personnel are a table-top model and a 27-foot prize-winning floor model entitled "Opportunities in the United States Public Health Service" (see illustration). The four-panel table-top model stands 32 inches high and is approximately 8 feet long when set up for display.

Recently completed by the Division is a series of exhibits each bearing the title "Service With Distinction," the keynote of the recruitment drive. Each exhibit in this series describes Federal-State-local health program relationships, opportunities for professional training in the Service, the growth and development of the Service since 1798, and the scope and variety of Service facilities and programs in this country and overseas (see illustration). Special mention is made of the Service's Commissioned Reserve program through which a national reserve of health and medical personnel is being organized, expanded, and trained for national emergencies.

The "Service With Distinction" series consists of two 17-foot floor exhibits, two 12-foot floor models, a 9-foot combination floor and table-top model, 40 table-top models, and 1,000 miniature counter-top displays. In addition, there is a refurbished film projection box, mounted on aluminum legs and bearing the theme title, for continuous showing of films at meetings. This unit also has a shelf for display of literature.

SPECIAL EXHIBITS

A number of programs in the Public Health Service are concerned with shortages of specific professional personnel. The following exhibits tailored to their needs have also been produced.

The Frontiers We Explore displays scenes illustrating opportunities for clinical nursing in the Public Health Service's National Institutes of Health, Bethesda, Md. (8 feet, floor model).

The People We Serve . . . The Service We Give, produced by the Division of Nursing Resources, depicts nursing opportunities throughout the Service (16 feet, floor model).

There's a Spot for You in Nursing, produced by the Division of Nursing Resources for the Committee on Careers of the National League for Nursing, illustrates nursing opportunities for nursing aides, practical nurses, professional nurses, and teachers, supervisors, and administrators (8 feet, floor model; 5 feet, table-top model).

Opportunities for Nurses, produced by the Division of Personnel, is designed to recruit nurses to meet needs throughout the Service (four panels of aluminum, each 30 inches high by 18 inches wide, portable table-top model; three models in use).

Indian Health Service Nursing . . . The Challenge We Meet, produced by the Division of Indian Health, shows how nurses in the Indian health program accept the challenge of providing hospital and public health services for 370,000 Indians and Alaskan natives (8 feet, floor model).

Sanitation Services for Indians . . . The Challenge We Meet, a new exhibit created by changing the headboard and photographs in the above display, depicts the Indian health activities of sanitary engineers (8 feet, floor model).

Health Careers Among the American Indians, designed by the Division of Indian Health, aims to interest professional personnel in the full range of therapeutic and preventive services provided by the Indian health program (9 feet, folding floor model).

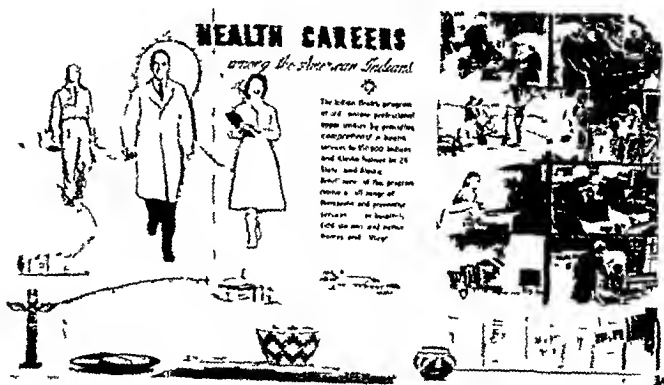
A New Approach to Indian Health, created by the Division of Indian Health, describes opportunities for professional personnel to work with other disciplines in the Indian health program (12 feet, floor model).



Opportunities for Nurses



Indian Health Service Nursing . . . The Challenge We Meet



Health Careers Among the American Indians

The Research Patient depicts activities of personnel staffing the supporting professional services in the Clinical Center, National Institutes of Health, Bethesda, Md. Photographs show how the research dietitian, research nurse, research social worker, and research therapist work together for the benefit of the research patient and, ultimately, of medical science (18 feet, floor model).

Opportunities for Engineers and Scientists was produced by the Division of Personnel, with the assistance of the Division of Sanitary Engineering Services, for recruitment of sanitary engineers, nuclear physicists, public health engineers, chemists and biologists, civil and other engineers, and sanitarians (four panels of pressed wood, each 2 feet high by 3 feet wide, portable table-top model; 20 models in use).

These Public Health Service recruitment films and exhibits have been in wide circulation at professional meetings during the past winter. Inquiries about availability may be directed to the Surgeon General, U. S. Public Health Service (P), Washington 25, D. C.

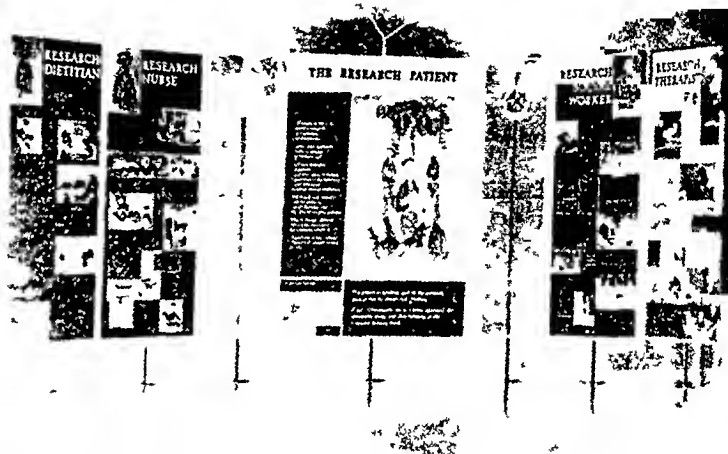
NATIONAL HEALTH COUNCIL FILM

The need for recruiting manpower for health careers has also been recognized by many voluntary agencies. An example is the 15-minute documentary film entitled "Health Careers," produced by the National Health Council as part of its Health Careers Horizons project. Like the Council's well-known publication, Health Careers Guidebook, this film is designed to interest young people in entering the health professions. It is a black and white 16-mm. film with sound track.

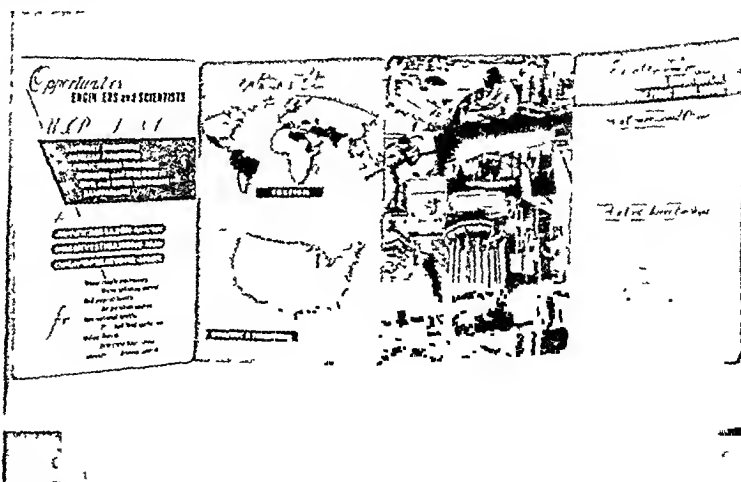
The film was developed with the guidance of 20 consultants representing secondary education and school counseling services for presentation to teen-agers, parents, counselors, teachers, and community groups. Inquiries about the film should be directed to Health Careers, National Health Council, 1790 Broadway, New York 19, N. Y.



A New Approach to Indian Health



The Research Patient



Opportunities for Engineers and Scientists

Health Insurance Coverage for Mental Illness

LOUIS S. REED, Ph.D.

TODAY in the United States approximately 116 million people have some health insurance coverage for hospital care: 101 million, for surgical service; 65 million, for medical service in the hospital; and 9 million, for physician service in the office, clinic, and home. Major health insurance carriers are the Blue Cross and Blue Shield plans, insurance companies through group and individual policies, and independent plans. The last type includes company and union self-insured plans, community-sponsored plans, and prepayment programs offered by private medical groups. Table 1 shows the number of persons covered for the various services by each type of plan.

Prepayment plans generally provide less extensive coverage for mental illness than for other types of illness. In part at least, this is due to the long duration of mental illness, to the fact that mental illness has traditionally been considered as separate and apart from other illness, and to the fact that much of the hospitalization for mental illness is provided

in government hospitals at little or no cost to the patient or his family.

The lesser coverage for mental illness creates problems for the subscribing public, for hospitals, and for the medical profession in general and psychiatrists in particular. To elucidate the present situation as regards coverage, I shall describe in turn the practices of each type of plan.

Blue Cross Plans

Most of the 80 Blue Cross plans in the United States offer two or more, and some a whole host of, subscriber contracts with varying provisions regarding duration of benefits, type of room or amount of room allowances, and the like. Some provide better coverage of mental and nervous cases (the terminology generally used by the plans) under one contract than under another. I shall deal only with the most extensive contracts of each plan.

The plans provide far less extensive coverage of mental illness than of other types of illness in general hospitals, and they provide far less extensive coverage of mental illness in mental than in general hospitals (table 2). The majority of the plans provide a maximum of between 60 and 120 days of care, generally per admission, for general illness. By contrast, 18 of the 80 plans provide no coverage whatever of mental and nervous cases in general hospitals, 3 provide coverage only until diagnosis as a mental case, and 1 covers for shock therapy or surgery only. Of the remaining plans, 8 provide 7 to 20 days of coverage, and 27, or about a third, between 21 and 30 days. Only 16

Dr. Reed is associate professor of medical economics, Sloan Institute of Hospital Administration, Cornell University. Long interested in the economics of medical care and prepayment plans, he made a nationwide survey of Blue Cross and related medical service plans in 1944-47. A paper on employee health benefit plans by Dr. Reed was published in the December 1957 issue of Public Health Reports. The present paper is based on one he delivered at the annual meeting of the American Psychiatric Association on May 14, 1957, in Chicago, Ill.

Table 1. Health insurance coverage in the United States, by type of coverage, according to type of carrier, Dec. 31, 1956

[Thousands of persons covered]

| Type of carrier | Type of coverage | | | | | |
|---|------------------|------------------|---------------------|-----------------|--------------------------------------|--|
| | Hospital care | Surgical service | Medical service in— | | Supplementary major medical policies | Comprehensive medical expense policies |
| | | | Hospital | Office and home | | |
| Blue Cross-Blue Shield and other plans sponsored by medical societies. Insurance companies: | 53, 162 | 42, 570 | 33, 907 | 3, 000 | (1) | 0 |
| Group policies..... | 45, 211 | 45, 906 | 25, 177 | 2, 000 | 6, 872 | 1, 413 |
| Individual policies..... | 27, 629 | 23, 074 | 6, 789 | 500 | 587 | 0 |
| Independent plans..... | 4, 654 | 4, 909 | 5, 276 | 3, 500 | 0 | 0 |
| Gross total..... | 130, 656 | 116, 459 | 71, 149 | 9, 000 | 7, 459 | 1, 413 |
| Deduction for duplicate coverage..... | 14, 707 | 15, 134 | 6, 258 | 300 | 0 | 0 |
| Net total..... | 115, 949 | 101, 325 | 64, 891 | 8, 700 | 7, 459 | 1, 413 |

¹ A fair number of the Blue Cross-Blue Shield plans have "dread disease" or "prolonged illness" supplementary contracts or riders which offer a coverage somewhat analogous to the major medical expense policies of insurance companies. Also, a few plans have issued major medical contracts. The number of persons covered under these supplementary Blue Cross-Blue Shield contracts is not known; it is probably in excess of 4 million.

Source: Data in all columns except "Medical service in office and home" are from the Health Insurance Council's *The Extent of Voluntary Health Insurance Coverage in the United States as of December 31, 1956*. Data in that column are my own rough estimates. The presentation of the data differs somewhat from that in the council's publication.

of the plans provide as many as 60 days of coverage in general hospitals. A few of the plans further limit coverage for mental illness by specifying that the prescribed number of days for mental care shall be the total provided during the lifetime of the member.

So far as I can calculate, approximately 30 percent of the plans provide the same coverage for mental cases in general hospitals as they provide for general illness; the remainder provide less or no coverage.

The coverage provided in mental hospitals is still less extensive. Almost half of the plans provide no coverage whatever; 3 cover only until diagnosis as a mental case; 1 covers for shock therapy or surgery only; 5 provide less than 21 days; 23, between 21 and 30 days; and only 10, more than 30 days. In a number of the plans these days are the maximum provided for life. Two plans exclude all care in government hospitals, and several exclude care available without charge in government hospitals. These provisions indicate that there is some question as to whether the State mental hospitals of the area charge for their services or not.

Several plans provide extensive coverage for mental cases. One provides up to 120 days per admission in either general or mental hospitals. Three of the plans offer special riders to their regular policies which provide an extra coverage of mental cases. Two of these, one at a cost of 12 cents and another at 15 cents a month for a family, provide up to 30 days for mental cases in either general or mental hospitals. The third, at a cost of 10 cents a month for a family, will extend the coverage for mental cases from the 30 days available under its ordinary certificate to 120 days in either general or mental hospitals.

The provisions of the plans regarding alcoholism, drug addiction, and self-inflicted injuries (attempts at suicide) are pertinent here. About two-thirds of the plans provide some coverage for alcoholism and for drug addiction, and almost all cover self-inflicted injuries (table 3).

Blue Cross coverage of mental illness has distinctly improved over the past decade. Ten years ago half of the plans excluded all coverage even in general hospitals, and only 5 out of

81 plans provided benefits in general hospitals for as long as 31 days.

Blue Shield Plans

Of the 64 Blue Shield plans, 4 provide only surgical service, 51 cover surgical and in-hospital medical service, and 9, under at least one of their contracts, also cover physicians' services in the office and home.

Thirty-three, or a few more than half, of the plans cover mental and nervous conditions on the same basis as all other conditions; 21 totally exclude these conditions; and the remaining 10 provide limited coverage (table 4). Mostly these last limit care to less than 30 days or to that provided in general hospitals.

Special interest attaches to the nine plans which offer comprehensive coverage of physicians' services, that is, care in the office, home, and hospital. Of these, 4 provide the same coverage for mental and nervous conditions as for

Table 2. Blue Cross coverage for general conditions and for mental conditions in general and mental hospitals, January 1957: number of plans providing specified days under most extensive contract

| Days of full-benefit care per admission or per year | General conditions | Mental conditions | |
|---|--------------------|--------------------------------|-------------------------------|
| | | General hospitals ¹ | Mental hospitals ² |
| No coverage..... | 0 | 18 | 38 |
| Until diagnosed..... | 0 | 3 | 3 |
| For shock therapy and surgery only..... | 0 | 1 | 1 |
| 1-10..... | 0 | 4 | 3 |
| 11-20..... | 0 | 4 | 2 |
| 21-30..... | 8 | 27 | 23 |
| 31-60..... | 7 | 7 | 4 |
| 61-90..... | 22 | 3 | 3 |
| 91-120..... | 31 | 9 | 3 |
| 121-180..... | 3 | 2 | 0 |
| 181-365..... | 4 | 0 | 0 |
| 366-730..... | 4 | 1 | 0 |
| 731-850..... | 1 | 1 | 0 |
| Total..... | 80 | 80 | 80 |

¹ 9 plans provide the specified days as a maximum during life of member.

² 8 plans provide the specified days as a maximum during life of member.

³ 1 excludes care in all government hospitals.

⁴ In acute general hospitals only.

SOURCE: Compiled from data in Blue Cross Guide, January 1957.

Table 3. Blue Cross coverage of alcoholism, drug addiction, and self-inflicted injuries, January 1957: number of plans with designated provision under most extensive contract

| Provision | Alcoholism | Drug addiction | Self-inflicted injuries |
|---|------------|----------------|-------------------------|
| Not covered..... | 29 | 26 | 6 |
| Covered until diagnosed..... | 1 | 1 | 1 |
| Covered on same terms as general conditions..... | 17 | 23 | 63 |
| Covered but in participating or general hospitals only..... | 13 | 10 | 3 |
| Covered in all types of hospitals but for fewer days than other cases: | | | |
| Less than 20 days..... | 4 | 4 | 0 |
| 20-31 days..... | 10 | 8 | 0 |
| Covered but in participating or general hospitals only, and for fewer days than other cases: | | | |
| Less than 20 days..... | 1 | 1 | 0 |
| 20-31 days..... | 2 | 2 | 4 |
| More than 32 days..... | 0 | 1 | 0 |
| Covered in participating or general hospitals and for limited periods in other hospitals..... | 2 | 1 | 1 |
| Other provisions ¹ | 1 | 3 | 2 |
| Total..... | 80 | 80 | 80 |

¹ Mainly covered in general hospitals but not in specified types of government hospitals.

SOURCE: Compiled from data in Blue Cross Guide, January 1957.

other conditions; 1 totally excludes these conditions; 1 covers only shock treatments or surgery; 1 covers only diagnosis in the office; 1 excepts psychiatric treatment; and 1 provides coverage for only 30 days.

About two-thirds of all Blue Shield plans provide some coverage of alcoholism and drug addiction, and the great majority cover self-inflicted injuries (table 4).

Insurance Companies

I shall deal first with group policies and then with individual policies.

Group insurance plans sold by insurance companies generally provide hospitalization coverage for 31 days or 70 days, occasionally for 120 days, and rarely for 180 days. With rare exceptions, these policies provide the same coverage for mental illness, alcoholism, drug addiction, and self-inflicted injuries as for all other

types of cases, and without distinction as to type of hospital.

Group surgical and in-hospital medical policies of insurance companies likewise usually cover these cases on the same terms as all other types of cases.

Most companies also sell group policies providing coverage of medical calls in the office and home, usually on a 2- or 3-visit deductible basis. In general these plans cover mental or nervous conditions; however, most are written with the condition that, for the employee, benefits will be paid only if he is disabled.

Within the past 6 years there has been a rapid growth of a type of insurance known as major medical expense insurance, written mainly on a group basis. This insurance supplements the basic hospital, surgical, and medical coverages and usually pays 75 percent of all medical care expense beyond the benefits under the basic coverages and a deductible amount paid by the insured. Within the past 3 years there has been a rapid growth of another type of insurance, called comprehensive medical expense insurance. These policies combine the basic and major medical coverages into a single package. They pay 75 to 85 percent of virtually all medical costs over specified initial deductible amounts and up to high maximum limits.

The practices under these policies in covering mental cases vary. Some policies cover mental illness on the same terms as all other illness. Other plans do this with the proviso that if the employee is not disabled or the dependent hospitalized the rate of reimbursement of expense for psychiatric treatment or consultations will be 50 percent instead of the usual 75 to 85 percent. Still other plans provide reimbursement in mental illness only for patients who are totally disabled or confined in a hospital.

Most of the major medical or comprehensive policies are rather new, and thus experience has been limited. Quite possibly the companies have not yet come fully to grips with the problems of providing care economically and at reasonable costs. In a letter to the author, one large company writes:

"The broad coverage [of mental illness now provided] may be of short duration. In one particular group policy . . . the claims for

Table 4. Blue Shield coverage of mental and nervous conditions, alcoholism, drug addiction, and self-inflicted injuries, March 1957: number of plans with indicated provision

| Provision | Nervous and mental conditions | Alcoholism | Drug addiction | Self-inflicted injuries |
|---------------------------|-------------------------------|----------------|----------------|-------------------------|
| Covers ¹ ----- | 33 | 35 | 38 | 51 |
| Excludes----- | 21 | 25 | 22 | 16 |
| Limited coverage----- | ² 10 | ³ 4 | ³ 4 | 1 |
| Total----- | 64 | 64 | 64 | 67 |

¹ To the same extent as other types of cases.

² 5 cover for a limited period, from 10 to 30 days; 2 cover only in general hospitals; 1 covers for shock therapy only; 1 covers for diagnosis only, and 1 cover except for psychiatric treatment.

³ 2 cover only in general hospitals; 1 covers for 30 days only; and 1 covers except for psychiatric treatment.

SOURCE: Compiled from data in Blue Shield Manual as revised to March 1957.

treatment of mental or nervous conditions amounted to well over one-third of the total claims, exclusive of maternity claims. The psychiatric charges at the beginning . . . were in the \$20 and \$25 bracket and the frequency was averaging between 1 and 2 treatments a week. Gradually the charges increased to \$36 a visit and the frequency to 6 times per week with no disability . . . involved.

"Obviously if we are to continue the broad coverage contemplated we must have some pattern which will show an insurable risk—a risk that we can measure and for which we can establish a premium."

Health insurance policies sold to individuals vary perhaps even more widely than group policies, and some companies issue a multitude of different policies with different provisions. Data on number of persons covered under the different provisions are not available. My impression is that the majority of policies exclude mental illness.

Independent Plans

Some of the independent plans are doing interesting experimentation in the coverage of mental illness.

The medical program of the United Mine Workers Welfare and Retirement Fund will

pay for care of patients with mental illness in general hospitals and will provide virtually unlimited care by psychiatrists in the office or outpatient department, to the extent such services are deemed essential. It pays for care in mental hospitals only when the prospect is that the patient will respond to care in a relatively short period, say 1 or 2 months.

The Health Insurance Plan of Greater New York, which provides service through medical groups, excludes alcoholism, drug addiction, and "coverage for psychiatric disorders after diagnosis, for which care is customarily provided by a psychiatrist." Each medical group is required to have a board-certified psychiatrist. The physicians in the group refer patients to him for diagnosis, and in establishing a diagnosis there is usually some form of treatment. However, the groups do not provide shock therapy or analysis. Visits to psychiatrists-neurologists amount to $\frac{1}{2}$ of 1 percent of the total number of services provided by all group physicians to members of the plan.

The Kaiser Foundation Health Plan, which provides services through its own medical groups and hospitals, excludes care for mental illnesses or disorders, attempts at suicide, and alcoholism. However, two of the larger medical centers now have psychiatric clinics. These provide testing and therapy at low fees, usually \$5 an hour. The personnel at one clinic includes 2 full-time and 1 part-time psychiatrist, 4 psychologists, and 2 psychiatric social workers. The extra fees charged subscribers do not pay the full expenses of the clinic, which is subsidized by the program as a whole. The program is reported to be very useful in relieving other services of chronic patients whose illnesses are more psychological than somatic.

Group Health Association in Washington, D. C., excludes psychiatric treatment. However, the staff includes two part-time psychologists who provide counseling service to subscribers at a charge of \$7 an hour.

The St. Louis Labor Health Institute provides psychiatric service. The staff includes 3 psychiatrists and 1 clinical psychologist, whose hours of service represent about 3 percent of the total of all physician hours.

Most of the large union health centers have part-time psychiatrists on their staffs. Psy-

chiatric visits tend to be about 1 or 2 percent of all visits.

These examples will suffice to indicate practices of independent plans. It is perhaps easier for plans which operate on group-practice principles to experiment with psychiatric coverage than it is for plans providing benefits through free-choice, fee-for-service arrangements.

Notes on Costs and Problems

A few figures may give some idea of the general magnitude of potential costs for coverage of hospitalization for patients with mental illness:

- At present about 2 percent of all patient-days in short-term general hospitals are for patients in the psychiatric units of these hospitals. This fact indicates that on the basis of prevailing practices full coverage of psychiatric cases in general hospitals should not increase a health insurance plan's costs by more than 2 percent.

- If prepayment plans undertook responsibility for the first 60 days of all admissions to all mental hospitals, including State institutions, and provided an average of 45 days per admission, they would assume liability for days of care amounting to an additional 10 percent of all days for general care. Since the cost per day in mental hospitals is, of course, lower than for general hospitals, this would represent less than a 10 percent increase in costs.

- One Blue Cross plan which covers mental cases for 120 days in general hospitals and for 30 days in other hospitals reports that its payments for mental, psychoneurotic, and personality disorder cases amount to 3.2 percent of its total inpatient payments. An insurance company estimates that under its basic hospitalization plans 3 to 5 percent of its hospital expense is for psychoneurotic disorders.

Among the problems in providing coverage for mental illness are the costs, in a setting where all types of plans are finding their costs expanding; the indeterminateness of these costs particularly when care over a long period in a hospital or physician's office is required; the question of how mental hospitals in this country should be financed and of demarcation of

the respective roles of patients, private insurance, and government in financing mental hospital care. All real coverage of psychiatric care in the office must await the development of prepayment for physicians' services generally in the office and home, a field in which experimentation and pioneering are the order of the day.

A quotation from a letter I received from the director of one independent prepayment

plan may well sum up the present position of prepayment plans and insurance carriers on coverage for psychiatric care:

"It seems to me that the most important fact is that no one has any idea as to what the utilization of complete psychiatric services would be if they were available on an insured basis. It is our hope, therefore, to extend coverage in this field bit by bit so as to learn as we go along, while avoiding too great a risk."

National Health Survey Advisory Committee

To enhance the usefulness of the U. S. National Health Survey of the Public Health Service, an advisory committee has been set up to include representatives of the health professions, insurance firms, labor, and other users of health statistics.

The new committee will review the plans and progress of the survey and help formulate principles and methods of cooperation with interested public and private organizations.

Leroy E. Burney, Surgeon General of the Public Health Service, is chairman of the committee, and George St.J. Perrott, chief of the Service's Division of Public Health Methods, serves as executive secretary.

The committee held its first meeting November 22, 1957.

Members of the committee are: Dr. Karl Bambach, vice president, American Drug Manufacturers Association, Washington, D. C.; Dr. Leona Baumgartner, commissioner of health, New York City; Pearl Bierman, medical care consultant, American Public Welfare Association, Chicago, Ill.; Dr. Paul E. Boyle, dean, School of Dentistry, Western Reserve University, Cleveland, Ohio; James Brindle, director, Social Security Department, United Auto Workers, Detroit; Arthur M. Browning, vice president, New York Life Insurance Co., New York City; Dr. W. D. Bryant, executive director, Community Studies, Inc., Kansas City, Mo.

Other members are: Dr. Bernard Bucove, State director of health, Olympia, Wash.; Dr.

Robin C. Buerki, executive director, Henry Ford Hospital, Detroit; George Bugbee, president, Health Information Foundation, New York City; Dr. Antonio Cioeco, head, Department of Biostatistics, Graduate School of Public Health, University of Pittsburgh; James F. Coleman, president, United Medical Service, Inc., New York City; Dr. J. S. Denslow, professor and director of research affairs, Kirksville College of Osteopathy and Surgery, Kirksville, Mo.; Dr. Robert P. Fischelis, secretary, American Pharmaceutical Association, Washington, D. C.

Also on the committee are: Dr. Norvin C. Kiefer, chief medical director, The Equitable Life Assurance Society of the United States, New York City; Dr. Allister M. Macmillan, Department of Sociology and Anthropology, Cornell University, Ithaca, N. Y.; Dr. Ross A. McFarland, Department of Industrial Hygiene, School of Public Health, Harvard University, Boston; Dr. H. B. Mulholland, Department of Internal Medicine, School of Medicine, University of Virginia, Charlottesville; Dr. Peter M. Murray, board of trustees, State University of New York, Albany.

Completing the list of members are: Marian G. Randall, R.N., executive director, Visiting Nurse Service of New York; Dr. Vergil D. Reed, vice president, J. Walter Thompson Co., New York City; Dr. James H. Sterner, medical director, Eastman Kodak Company, Rochester, N. Y.; James E. Stuart, executive director, Hospital Care Corporation, Cincinnati, Ohio; and Dr. Ray E. Trussell, executive officer, School of Public Health and Administrative Medicine, Columbia University, New York City.

Cost Analysis for Collegiate Programs In Nursing

Part I. Analysis of expenditures
Part II. Current income and other resources

National League for Nursing and PHS Publication. By Leslie W. Knott, Ellicynne M. Vreeland, and Marjorie Gooch. Part I, 1956, 166 pages; \$3.50. Part II, 1957, 46 pages; \$2.00.

Although these manuals are focused on analyzing costs of nursing education, the techniques and methods described should prove useful for other types of education programs.

Part I contains a general discussion of underlying principles, defines terms, and describes the methods used. Part II, in addition to discussing the usual sources of education income, includes suggested methods for evaluating student service.

Schedule forms for organizing and analyzing cost information are presented with illustrative data based on a fictitious university carried through the analysis step by step.

Copies can be obtained from the National League for Nursing, 2 Park Avenue, New York 16, New York.

Reported Tuberculosis Data, Calendar Year 1955

PHS Publication No. 560. 1957. By Stanley Glaser and Paul L. Roney. 29 pages. 25 cents.

This fourth annual summary presents data supplied to the Public Health Service on the Annual Tuberculosis Report by all the States, the District of Columbia, Alaska, Hawaii, and Puerto Rico.

The data cover newly reported tuberculosis cases for the United

States and each State by source of morbidity report, activity status, form and extent of the disease, race, sex, and age, as well as X-ray case-finding activities, mortality, and public health nursing visits.

An analysis of each table summarizes data for the years 1952 through 1955 and points out pertinent characteristics inherent in the data.

Biological Products

PHS Publication No. 50. Revised April 15, 1957. 52 pages.

Superseding Public Health Service Publication No. 50, revised April 15, 1955, this edition lists the establishments holding licenses for the preparation and sale of viruses, serums, toxins and analogous products, and the trivalent organic arsenic compounds.

Comparative Mortality Among Metropolitan Areas of the United States, 1949-51

102 causes of death

PHS Publication No. 562. 1957. By Nicholas E. Manos. 143 pages. \$3.25.

This graphic and tabular presentation of 1949-51 mortality, from 102 causes, in the United States includes ratios of observed to expected mortality for 163 metropolitan areas; mortality rates and ratios by degree of urbanization; and background material necessary to the interpretation of these data. It was prepared under the direction of the Air Pollution Medical Program, Public Health Service.

Mortality ratios are emphasized as a tool for comparative analysis, and mortality data are presented in greater geographic detail than has heretofore been available.

The 102 causes of death are grouped into 10 categories, including respiratory system diseases, circulatory system diseases, malignant neoplasms, and a group of miscellaneous diseases and conditions. Mortality comparisons from city to city, by cause, as well as comparisons between the central city and outlying areas of the 163 metropolitan areas, are shown.

While no analysis accompanies the statistics, the graphic form of presentation points up variations which suggest possible areas of research on the effects of environmental factors on mortality.

Meeting Community Sewage Treatment Needs Under the Construction Grants Program

PHS Publication No. 558. 1957. Folder.

The Federal grant program for construction of sewage treatment works, authorized under the Federal Water Pollution Control Act, Public Law 660, 84th Cong., is briefly described. Eligibility requirements and application procedures are outlined, and State water pollution control agencies cooperating with the Public Health Service in administering the program are listed.

Handbook of Selected Biological References on Water Pollution Control, Sewage Treatment, Water Treatment

Public Health Bibliography Series No. 8. PHS Publication No. 214. Revised 1957. By William Marcus Ingram. 95 pages; illustrated. 45 cents.

This revised handbook lists by subject numerous biological publications relating to various aspects of water pollution, waste treatment, and water supply that have appeared in recent technical literature. The references were selected on the basis

of their availability and potential usefulness to those not trained primarily in biology. The intent of the handbook is to provide information fundamental to a good understanding of biological problems that could arise in the course of water pollution control and related work.

A list of references on organism identification is included. Basic readings on ecology and water treatment are suggested in the introduction.

Facts About the Federal Water Pollution Control Act of 1956

PHS Publication No. 555. 1957. 16 pages. 15 cents.

Intended for community leaders, State and municipal officials, and others interested in control of water pollution, this booklet outlines briefly the provisions of the Federal Water Pollution Control Act of 1956 (Public Law 660, 84th Cong.) and the Public Health Service program authorized by the new law. Activities under this program include comprehensive program development, interstate cooperation, research and technical assistance, collection of basic data, State and interstate program grants, construction grants, and enforcement measures against interstate pollution.

Background information on earlier Federal legislation for pollution control is given, and the role which control of pollution plays in augmenting and conserving water resources to meet increasing demands is described.

How To Study Supervisor Activities in a Hospital Nursing Service

PHS Publication No. 496. 1957. By Elinor D. Stanford and others. 47 pages. 40 cents.

Third in a series developed by the Division of Nursing Resources, Public Health Service, for use by hospitals and others desiring to study

nursing personnel activities, this manual provides the supervisor with a method for examining her actual activities in relation to the functions which she believes appropriate to her job. The steps in the study and the method of observation employed are described in detail.

Instructions for training observers and for tabulating material are included.

Directory of Full-Time Local Health Units, 1957

PHS Publication No. 118. Revised 1957. 70 pages. 30 cents.

This listing of full-time health units serving local areas, together with the name of the health officer of each unit or other designated administrative head, was revised July 1957. The local units are listed by State, giving in each instance the health area jurisdiction, post office address, and the health officer's name and official title.

Facts About Indian Health

PHS. Publication No. 479. Revised June 1957. 8 pages.

With up-to-date statistics and facts, this revised edition describes briefly the Indian health problem and the program of the Division of Indian Health, Public Health Service.

Socioeconomic Characteristics of Persons Who Married Between January 1947 and June 1954: United States

Vital Statistics—Special Reports. Selected Studies. Vol. 45, No. 12, Sept. 9, 1957. By Hugh Carter, Sarah Lewitt, and William F. Pratt. Pages 271-353; tables and charts. 45 cents.

Based on a sample survey of persons who married between January 1947 and mid-June 1954, data are

given on residence at time of marriage as related to place of marriage, number of times previously widowed or previously divorced, number of times married, age at marriage, years of school completed, labor-force status of wife, and major industry group of husband.

There are cross tabulations of characteristics of the husband as related to those of the wife, as well as separate tabulations for husbands and wives. An analytical text, text tables, and charts precede 30 detailed tables of basic data.

The data were obtained through a special supplementary survey carried out by the Bureau of the Census in its current population survey. Tables of sampling errors are included.

Facts on Mental Health and Mental Illness

PHS Publication No. 543. 1957. 11 pages. 10 cents.

Known facts about mental illness are summarized and the need to know more is pointed out in this booklet. It shows the scope of the problem and cites new knowledge gleaned through recent research as well as progress made in the care, treatment, and rehabilitation of the mentally ill, and in the training of specialists in the mental health field. What is needed to solve this major health problem is outlined.

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared by other Federal agencies.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications other than its own.

New Viruses Observed in Children With Respiratory Diseases

ROBERT M. CHANOCK, M.D., ROBERT H. PARROTT, M.D., JOSEPH A. BELL, M.D.,
WALLACE P. ROWE, M.D., and ROBERT J. HUEBNER, M.D.

EVENTUAL control of the common respiratory diseases depends on the determination of their etiology. Despite recent notable advances in delineating the viral etiology of such illnesses—at least 70 newly recognized viral agents have been described since 1948—the causes of most remain to be found. The preliminary report outlined here presents data on two new respiratory viruses which have been found in children with respiratory illnesses and which, while biologically related to influenza and mumps, are also quite distinct.

Previously unrecognized myxoviruses classified in two serologic groups were isolated from children with respiratory illnesses during October and November 1957 (1). These two new groups of agents, provisionally called hemadsorption (HA) viruses types 1 and 2, were isolated in monkey kidney cultures with the use of the hemadsorption technique recently introduced by Vogel and Shelokov (2, 3). Preliminary clinical and epidemiological observations indicated that these agents might be responsible for a proportion of the common acute respiratory illnesses in children which remain largely unexplained despite recent advances exemplified by the discovery of adenoviruses (4, 5) and other new agents (6-9).

The type 1 HA virus was isolated from 35

children, 8 of whom were studied in Washington, D. C., hospitals and 27 of whom were involved in an outbreak of febrile respiratory illness in a nursery group of a District of Columbia welfare institution (Junior Village). When throat swabs were collected on one day from all infants in the affected nursery and tested for HA viruses, epidemiological analysis indicated that there was a significant association of type 1 HA virus isolations with febrile illnesses (chi-square test indicated $P=0.03$), thus strongly suggesting but not proving an etiological relationship. The illnesses were characterized by fever of 2 to 3 days' duration and cough. Nearly half of the cases had moist medium to fine rales; several had coarse breath sounds and rhonchi.

Type 2 HA virus was isolated from three infants with acute laryngotracheobronchitis (croup), and more experience will be required with this agent before its etiological importance in disease can be determined.

Acute and convalescent serum specimens from patients yielding either type 1 or type 2 virus showed substantial antibody rises in complement fixation and hemagglutination inhibition tests. Specimens from 82 hospitalized patients without respiratory illnesses did not yield the two viruses.

The contribution of the HA viruses to the total respiratory disease picture cannot be assessed at this time. However, serologic data suggest that the contribution of these agents to childhood respiratory illnesses may be substantial. Preliminary surveys for antibodies against HA viruses in the serums of 55 adults,

Dr. Chanock, Dr. Bell, Dr. Rowe, and Dr. Huebner are all with the Laboratory of Infectious Diseases, National Institute of Allergy and Infectious Diseases, Public Health Service. Dr. Parrott is physician-in-chief of Children's Hospital, Washington, D. C., with which Dr. Chanock is also associated.

nearly all young males, showed that all had neutralizing antibodies to type 1 virus, and 39 had neutralizing antibodies to type 2.

The following properties indicated that the HA viruses are members of the myxovirus family. Both types 1 and 2 HA viruses agglutinated guinea pig and chicken red cells: They propagated in the amniotic cavity of the embryonated hen's egg, they possessed erythrocyte

receptors sensitive to RDE (receptor destroying enzyme of *Vibrio cholerae* filtrate), and they were sensitive to ether.

Studies of the serologic relationships of HA viruses to other myxoviruses, as determined by the use of specific animal serum, are reported elsewhere (1). The table shows distinct immunological differences from influenza A, B, and C, mumps, and croup associated (CA)

Relationship of types 1 and 2 hemadsorption (HA) virus to certain myxoviruses, as shown by representative complement fixation tests with human serums

| Infection, patient, and serum | Reciprocal of CF antibody titer with 4 units of indicated antigen | | | | | | | | | |
|----------------------------------|---|--|---|--|---|----------------|-------------------------------|----------------|-------------------------------|----------------------------------|
| | HA type 1 MK antigen ¹ | HA type 2 MK antigen ¹ | Influenza A Asian CAM antigen ² | Influenza B CAM antigen ² | Influenza C chick embryo extract antigen ³ | Sendai | | Mumps | | CA MK antigen ¹ |
| | | | | | | CAM antigen | Allantoic fluid antigen | CAM antigen | Allantoic fluid antigen | |
| Type 1 HA | | | | | | | | | | |
| Patient Ha: | | | | | | | | | | |
| Acute..... | <8 | <8 | <8 | <8 | <8 | <8 | <8 | <8 | <8 | <8 |
| Convalescent... | 64 | <8 | <8 | <8 | <8 | <8 | <8 | <8 | <8 | <8 |
| Patient Mo: | | | | | | | | | | |
| Acute..... | <8 | <8 | <8 | <8 | <8 | <8 | <8 | <8 | <8 | <8 |
| Convalescent... | 64 | <8 | <8 | <8 | <8 | <8 | <8 | <8 | <8 | <8 |
| Type 2 HA | | | | | | | | | | |
| Patient Se: | | | | | | | | | | |
| Acute..... | <8 | <8 | <8 | <8 | <8 | <8 | <8 | <8 | <8 | <8 |
| Convalescent... | 64 | 64 | <8 | <8 | <8 | <8 | <8 32 | <8 | <8 | <8 |
| Patient Se: | | | | | | | | | | |
| Acute..... | 16 | <8 | <8 | <8 | <8 | <8 | <8 | <8 | <8 | <8 |
| Convalescent... | 64 | 64 | <8 | <8 | <8 | <8 | <8 32 | <8 | <8 | <8 |
| Influenza A Asian | | | | | | | | | | |
| Patient Su: | | | | | | | | | | |
| Acute..... | 16 | <8 | <8 | | | | | | | |
| Convalescent... | 16 | <8 | 32 | | | | | | | |
| Patient Bu: | | | | | | | | | | |
| Acute..... | 16 | <8 | <8 | | | | | | | |
| Convalescent... | 16 | <8 | <32 | | | | | | | |
| Influenza B | | | | | | | | | | |
| Patient Ba: | | | | | | | | | | |
| Acute..... | 8 | 8 | | <8 | | | | | | |
| Convalescent... | <8 | <8 | | 64 | | | | | | |
| Patient St: | | | | | | | | | | |
| Acute..... | 32 | 16 | | <8 | | | | | | |
| Convalescent... | 32 | 8 | | 64 | | | | | | |
| Influenza C | | | | | | | | | | |
| Patient Tr: | | | | | | | | | | |
| Acute..... | 8 | <8 | | | <8 | | | | | |
| Convalescent... | 8 | <8 | | | 64 | | | | | |

¹ Monkey kidney tissue culture antigen.

² Chorio-allantoic membrane extract antigen centrifuged for 1 hour at 20,000 r.p.m.—group specific antigen.

³ Chick embryo extract antigen centrifuged for 1 hour at 30,000 r.p.m.

viruses, as shown through use of paired acute and convalescent serums from patients with HA and influenza virus infections.

In representative complement fixation tests, persons infected with both type 1 and type 2 showed no rises to influenza A, B, or C when tested against the group-specific CF antigens of these agents. Type 1 HA virus was shown to be different from Sendai, mumps, and CA viruses by these same serums. Type 2 HA virus was not related to mumps or CA virus, but showed a relationship to Sendai virus, which has recently been proposed as the prototype influenza D virus (10). Children who were infected with type 2 HA virus, and who developed complement fixing antibody for the homologous virus, also developed antibody for Sendai viral antigen but not for the Sendai chorio-allantoic membrane extract (soluble) antigen. Guinea pigs immunized with Sendai virus also developed CF antibody to type 2 HA virus, but in the hemagglutination inhibition and neutralization tests these agents were shown to be distinct (1).

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International Classification of Diseases Revised

The seventh revision of the Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death, effective January 1958, to be used by the United States and other members of the World Health Organization for the next 10 years, is now available in two volumes, at \$3.50 for the set. The first volume contains the classification; the second, the alphabetical index. The Public Health Conference on Records and Statistics is again consolidating orders in the United States. Orders and checks payable to that organization may be addressed c/o Department of Health, Education, and Welfare, National Office of Vital Statistics, Washington 25, D. C.

New Members of the PHR Board of Editors



Dr. Chope



Mr. Hunter



Dr. Kidd



Dr. Langmuir



Dr. Sowder

Five new members will attend the April meeting of the Board of Editors of Public Health Reports. Retired from the Board are Harold M. Erickson, Lloyd Florio, Victor H. Haas, and Seward E. Miller.

Harold D. Chope, M.D., Dr.P.H., has been director of the San Mateo County (Calif.) Department of Public Health and Welfare since 1948. After taking his doctorate in public health from Harvard University (1940) where he had also been a Rockefeller Foundation fellow during work on his master's degree, he was, from 1940 to 1948, successively, associate in public health administration at Harvard; Rockefeller Foundation staff member in São Paulo, Brazil; and assistant district health officer, San Joaquin Local Health District, Stockton, Calif. Prior to 1940 he served as chief of the bureau of epidemiology, St. Louis City Health Department, assistant director of the California State Health Department, and health officer, Newton, Mass. From 1936 to 1941 he lectured at the Simmons School of Public Health Nursing and directed a field training unit at Harvard from 1935 to 1940. He was clinical professor of preventive medicine at Stanford University in 1955, and, from 1947 to the present, has been lecturer at the University of California School of Public Health.

J. Stewart Hunter, M.A., assistant to the Surgeon General of the Public Health Service since 1950, serves as staff adviser on public information and supervises the information and publications programs of the Service. From March 1953 until October 1955, at the request of the Department, he served as acting director of publications and reports for the Secretary of Health, Education, and Welfare. He came to the Service in June 1949 from a position as associate director of the public relations department of the Chicago office of J. Walter Thompson Co. After serving on the information staff of the Office of Price Administration during the early part of 1942, he saw active duty as lieutenant commander in the U. S. Naval Reserve from October 1942 to January 1946, the majority of the time as an officer on an aircraft carrier in the Pacific. Subsequently, he lectured in English at Northwestern University. He is a graduate

of the University of Pittsburgh, where he taught from 1930 to 1942, except during 1937-38, when he served as associate and managing editor of the *Pittsburgh Bulletin Index*.

Charles V. Kidd, Ph.D., has been chief of the Office of Research Planning of the National Institutes of Health, Public Health Service, since 1949. He is also executive secretary of the consultants on medical research and education to the Secretary of Health, Education, and Welfare. In 1947 he was executive secretary of the President's Scientific Research Board, and later was a staff member of the President's Council of Economic Advisers. He received a Rockefeller public service award in 1955. He took an A.B. from Princeton in 1935, a diploma in history from Munich in 1936, and a Harvard doctorate in 1937.

Alexander D. Langmuir, M.D., M.P.H., has been chief of the Epidemiology Branch, Communicable Disease Center, Public Health Service, since 1949. From August 1942 to July 1946, he was the epidemiologist of the Commission on Acute Respiratory Diseases of the Army Epidemiological Board, Fort Bragg, N. C. He served in the New York State Department of Health from February 1937 to August 1942 in various capacities, including that of deputy commissioner of health of Westchester County. Before coming to the Communicable Disease Center, he was associate professor of epidemiology at Johns Hopkins School of Hygiene and Public Health for 3 years. In 1955 he served as a member of the WHO Committee on Poliomyelitis Vaccine. Since 1947 he has been consultant on biological warfare to the Secretary of Defense.

Wilson T. Sowder, M.D., M.P.H., Florida State health officer for the last 13 years, entered the Public Health Service as a commissioned officer in 1931. He served in hospitals, quarantine stations, and the Coast Guard, and in venereal disease control work in Tennessee and Florida. He was also a consultant on communicable diseases in the War Shipping Administration and consultant in the Service's regional office in Dallas, Tex., until his resignation in 1956 from the Regular Corps to remain in Florida. He took his medical degree in 1932 from the University of Virginia, and his master's degree in public health from the Johns Hopkins University in 1939.

Radiation as a Public Health Problem

DAVID E. PRICE, M.D.

TO BE CLASSIFIED as a public health problem, a hazard must bear an important relationship to human health or disease. It must, furthermore, affect a significant part of the population, and it must be amenable to remedial action which is within the power of society to undertake.

Unquestionably, ionizing radiation meets the first two of these criteria. It has a relationship to human health and affects a significant part of the population. However, the design of social action deserves thoughtful consideration.

Past experience in public health has taught us that a problem usually becomes rather serious before people band together to deal with it. Only when a considerable amount of disease could be traced to polluted water did we begin to develop sewage treatment and other antipollution measures. Only when motor accidents had taken an alarming toll did citizens insist on better roads, safety devices, and various accident prevention programs. Traditionally, and in the main this is probably one of mankind's happier traits, we do not go looking for trouble. Not until the trouble looms so large it can no longer be ignored do we find the incentive to band together and pool resources—neighborhood, city, State, or Nation—to do something about it.

In dealing with the health hazards of ionizing radiation, unfortunately, this traditional approach cannot promise success. The effects of ionizing radiation are cumulative and irreversible. They are subtle and may become ap-

parent only after long delay. If we wait until there are obvious signs of radiation damage it will be too late to help the affected population or to decontaminate the polluted environment successfully. In this situation, prevention is not merely desirable, it is imperative.

Finding the proper incentive to stimulate preventive action, however, is not easy. In my opinion, to use fear as the incentive for action is not only unwarranted and undesirable, but useless. Panic or hysteria seldom results in constructive activity. Factual information may stimulate constructive public action. The public should know what public health workers are doing to promote radiological health and what more they think they ought to be doing.

Since we do not yet know at what point the harmful effects of prolonged, low-level exposure may outweigh the benefits of manmade radiation, we suggest that all unnecessary radiation exposure should be avoided. Consequently, much of our efforts in public health thus far are being directed toward finding what exposure is unnecessary and how it can be avoided.

Reducing X-ray Exposure

One of the major sources of radiation exposure today is the X-ray. If we can reduce needless exposure to X-ray without reducing its manifold benefits in the detection and treatment of disease, we have taken a significant step toward reducing the dimensions of the radiation exposure hazard. Much health agency activity in the radiological field is currently directed toward this goal.

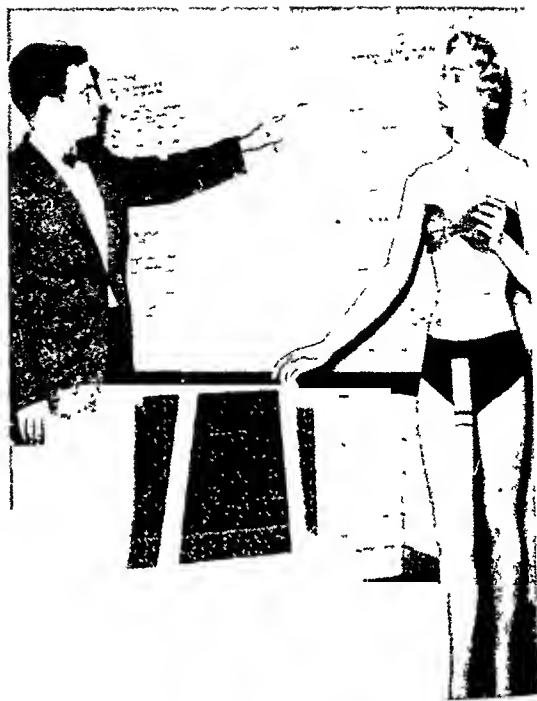
For example, public health agencies for several years have been making a concerted drive to eliminate the use of the fluoroscopic shoe-

Dr. Price, chief of the Bureau of State Services, Public Health Service, delivered this address at a symposium of the American Association for the Advancement of Science, Indianapolis, December 30, 1957.

fitting machine. This machine serves absolutely no practical purpose. Moreover, if a child uses it each time he gets a new pair of shoes, he gets a considerable dosage of radiation over the years particularly since many of these machines deliver a scattered dose over a rather large part of the body. This is obviously a source of radiation that can be eliminated without the sacrifice of any beneficial result. The shoe industry has been cooperative. Shop owners, once they are fully informed of the facts, seldom show any reluctance to remove these machines. The main reason this type of shoe-fitter continues to be used is because there are not enough people, health officials or others, who have the information, the time, and the interest to work on the drive to eliminate this hazard.

Another example of unnecessary exposure is the indiscriminate use of the X-ray in tuberculosis surveys. When tuberculosis was more widely prevalent, communitywide mass X-ray surveys were justified. The early case finding from such surveys has unquestionably saved thousands of lives. There are still communities in the United States today where the prevalence of the disease makes mass X-ray campaigns desirable. However, there are other groups of people among whom the disease is so rare that the mass X-ray approach is no longer the best case-finding method. Consequently, the Public Health Service has recently recommended a more selective use of this procedure.

Interestingly enough, when this recommendation was publicly announced, it was interpreted by some as implying that mass X-rays were especially hazardous and that the Public Health Service opposed their use. This is an example of the emotional exaggeration that creates unwarranted fears and hampers constructive efforts to promote health objectives. Any general reluctance on the part of the public to accept diagnostic X-rays, when recommended by responsible authorities, would certainly be far more injurious to health than would the slight additional amount of radiation exposure. The vast majority of papers and other mass media made it clear that the individual X-ray in itself is not hazardous and that in areas where tuberculosis is prevalent mass X-ray surveys are still a valuable case-finding technique.

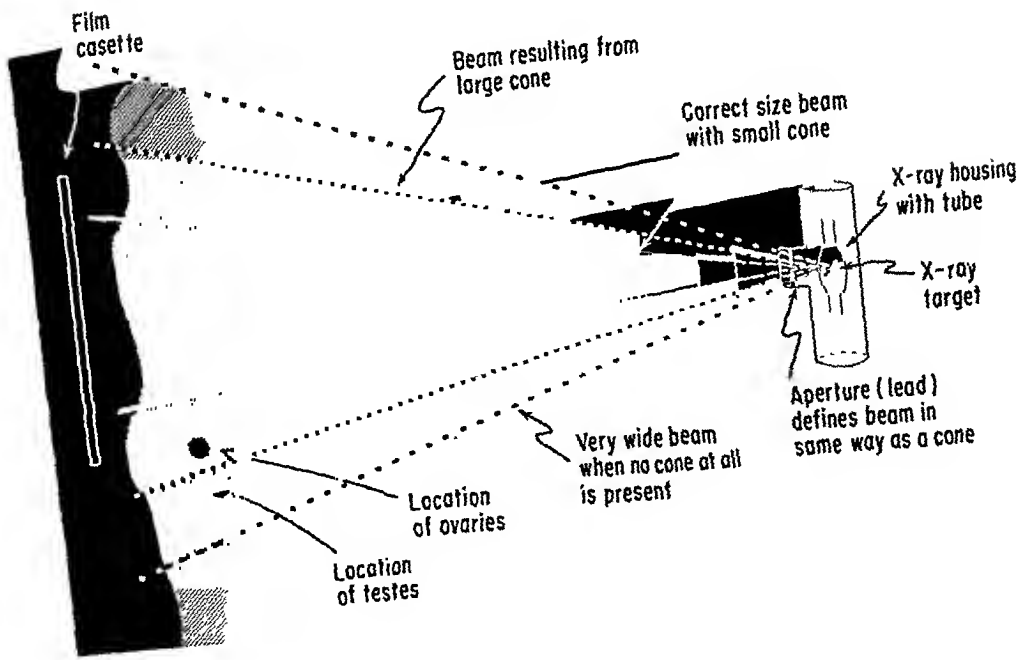
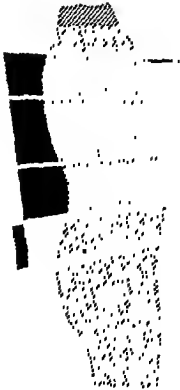
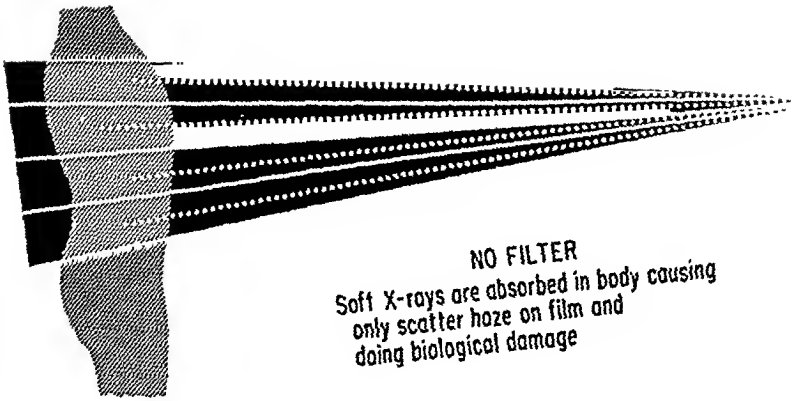


(Above) Without impairment of X-ray pictures, technicians adjust cones, filters, distance, and voltage so as to reduce radiation doses as much as 75 percent. The white strips on the model fluoresce under radiation to indicate exposure of strategic tissues, during demonstrations of X-ray techniques conducted by the Public Health Service. Dr. Walter Stahl points to charts (opposite page) which explain the value of these adjustments. Accompanying tables show the dose to different organs under various conditions.

(Top right) An aluminum plate absorbs soft X-rays, which lack energy to pass through the patient directly to the radiographic plate. Soft X-rays fuzz the X-ray picture and contribute an unnecessary dose to the patient. A cone, absent here, would further confine the dose.

(Below right) Too large a cone, or complete absence of a cone, permits beams intended for a chest plate to strike organs which should be protected. Even with a correct cone, irrelevant portions of the body may receive a radiation dose if the tube is too far from the patient.

X-ray film



A third example of the opportunity to reduce unnecessary exposure to X-ray lies in the reduction of the radiation doses delivered in medical and dental examinations. It is an unfortunate fact that many of the more than 160,000 X-ray machines being used in the healing arts today deliver a higher dose of radiation than is necessary. There is room for much improvement both in the machines themselves and in the techniques of their use. To drive home this point, our radiologists use a wax model taped and instrumented to show radiation dosage. They take a chest X-ray with typical equipment and employ a commonly used technique. Then, changing the cone of the machine, focusing more precisely, and making a few other adjustments, they take an equally useful film, but expose the monitored tissues to only 1/35th as much radiation.

Several studies now under way within the Public Health Service are designed to perfect techniques that will produce films of maximum value with minimum exposure and to provide better measurement of the doses delivered. Hand in hand with such studies, however, must go the training of technicians to make use of the equipment and procedures which are already available and which reduce substantially the radiation dosage received by both the patient and the operator.

Other studies are being carried out by public health personnel at all levels of government to reduce unnecessary X-ray exposure. As more physicians, dentists, and other members of the healing arts become aware of all that they can do to prevent unnecessary exposure, the X-ray hazard can be controlled. The problem is primarily one of research and of getting the findings of such research to professional groups, most of whom will readily understand their significance and apply them to their practice.

Measuring Environmental Radiation

The development of nuclear energy brings new significance to every effort to minimize exposure so that hazards may be balanced against the benefits of radiation not only in the healing arts but also in industry.

Therefore, along with drives against unnecessary X-ray exposure, health agencies are con-

New Radiological Health Division

On recommendation of the Surgeon General and approval of the Secretary of Health, Education, and Welfare, a Division of Radiological Health has been set up in the Bureau of State Services with Francis J. Weber, M.D., as chief. Dr. Weber, a commissioned officer of the Public Health Service, comes from Region 8, Department of Health, Education, and Welfare, Denver, Colo., where he was regional medical director.

cerning themselves with environmental sources of radiation.

Before he split the atom, man gave little thought to the background radiation in nature. Consequently, although we know that there is great variation in the background radiation of different localities, we have little information about what these levels are for any given area or for its air, water, or food. Obviously, it is necessary to have such information in order to determine how much radiation manmade sources are adding to the environment. Moreover, the time when we can obtain such data is fast slipping away. Ideally, these baseline studies should have been made before the first atom was split. Nevertheless, if we get this information as rapidly as possible, it will still be extremely valuable in helping us to make better health evaluations of exposure doses.

Baseline data are now being obtained on a limited scale. The focus of most of these monitoring activities is within the Atomic Energy Commission. However, the Public Health Service, in cooperation with State health departments and community groups, has operated for the past 5 years some 100 air and rain surveillance stations in order to measure community air pollutants, including radioactive pollutants. More recently, the Service has established about 40 stations for surveillance of water pollution. Here, too, analysis of collected samples includes radioactive pollution. The only food study in which the Public Health Service is currently participating is the collection and analysis of milk for strontium-90 and other radioactive elements. These studies are being conducted in five major milk shed areas.

The Food and Drug Administration is conducting other limited surveys. All of these baseline studies need to be expanded . . . now.

Baseline data are needed as a guide in the selection of reactor sites and as a gauge for determining how much and how rapidly radioactive waste from industry and from fallout is being added to the environment in any given area.

Such data may also prove helpful in the development of epidemiological studies. To date, studies of permissible radiation doses have been based primarily on observations of persons exposed to abnormally high radiation dosages and are, at best, estimates. In order to evaluate the public health significance of radiation, we need to devise means of measuring the far more subtle effects of prolonged, low-level exposure. Since the damage from this type of exposure extends over years and generations, the difficulties of the measurement task are too obvious to need delineation here. We place a high priority on such research. The information is needed not only to provide a better basis for establishing practical radiation dose limits but also to relieve the public of those exaggerated fears which inevitably occur when one is dealing with unknowns.

The increasing public awareness and concern about radiation exposure has been focused primarily on the matter of weapons testing. A far more important potential source of environmental radiation exposure is the rapidly growing number of power reactors based on nuclear fission. For this reason, long before the Shippingport, Pa., atomic power plant began operating in December 1957, health personnel, both Federal and State, were working closely with the designers of that installation. Radiation specialists from the Public Health Service and the Pennsylvania Health Department participated in planning the installation and operation of the waste treatment system at the Shippingport reactor. This collaboration includes baseline studies of the Ohio River system, the receiving stream.

The Shippingport operation has given industry, the Atomic Energy Commission, and the Federal-State health services an excellent opportunity to work out a practical pattern of

cooperation in the interest of public health safety. This cooperation will continue, and operating experience will provide an opportunity to test theory against practice.

A pioneering operation such as this naturally commands the careful and personal attention of highly trained experts. But what is going to happen as the industry expands? Will the same precautions always be taken? Traditionally, State agencies, and in most States, it is the health department, have assumed responsibility for seeing that every industry within their jurisdiction operates in such a way as not to endanger the health of the workers or of the other citizens of the community. Public health supervision of radiation sources in industry is therefore not a totally new concept. It fits into the existing pattern of industry and health department relationships. But it does present new challenges.

Will States and communities accept these challenges in time? To date, there are radiological health programs in only a few State health departments. All States need them. To date, only a few communities have any accurate idea of the sources and amounts of radiation to which their people are exposed. Every community should be taking this first step of assessing the radiation burden.

It will not long be feasible for the public to rely entirely on the users of radiation sources for assurance of community health protection. As nuclear sources of power begin to compete with conventional sources, there will undoubtedly be severe economic pressures to lower operating and capital costs. The public health agencies should be prepared to assure that such economies are not made at the expense of public health considerations.

Three Major Challenges

Summing up, radiation presents three major challenges to the public health profession. First, the public must be alerted to the need for greatly expanded radiological health programs which can provide security from fears that would hamper the constructive development of atomic industry and atomic medicine. Public understanding is basic because adequate radiological health programs require both legal au-

thority and financial support on a scale possible only when there is general public acceptance.

The second big problem is that of trained manpower. Radiological health is a specialized field with concepts, vocabulary, units of measurement, and sensitive instrumentation of its own. With the increase of radiation sources, there must be a corresponding growth in health personnel who have the training required to provide planning, surveillance, and other services. However, since highly trained specialists are produced slowly and since there is much to be done right now, the Public Health Service is providing practical training to the existing staffs of State and local health departments. This is done by courses and seminars designed to instruct trainers, persons who can conduct similar programs in their own areas. In addition, the corps of specialists needed as teachers and researchers must be increased. For this task, we look to our colleges and universities.

The third major need is research. I have touched upon the need to know the probable doses and the biological effects. The engineering field is presented with equally momentous challenges. For example, we have yet to find a satisfactory and economical method of disposing of high-level radioactive waste. The Atomic Energy Commission already has more than 65 million gallons of radioactive waste buried in tanks in the earth. As the Nation becomes dotted with nuclear energy plants, what is to be done with these high-level wastes? We are getting by at present with temporary expedients; we must seek long-range solutions.

In conclusion, I say again that, from a public health standpoint, radiation is still a preventable health hazard. I believe we can keep it so, if we act now. Since we recognize that all radiation is harmful and that its effects are cumulative and irreversible, the price of delay in the vigorous pursuit of research and control efforts might well prove to be intolerably high.

Graduate Fellowships in Public Health

Through projects in Massachusetts, Louisiana, and California, fellowships of \$2,500 are available for the second year of graduate study to social workers interested in the field of public health.

With assistance from the Children's Bureau, the health departments of the States have set up educational programs focused on social work practice in public health, in schools of social work. Participating are the schools of social work at Boston College, Boston University, Simmons College in Boston; Tulane University School of Social Work; and the University of California School of Social Welfare, Berkeley.

The University of California is also offering fellowships of \$3,600 for a year of supervised practice in public health following completion of the second graduate year.

Further information about these fellowships may be obtained by writing to the dean of any of these schools of social work. Applications should be made before April 15, 1958.

Foodborne Epidemic of Group A Beta Hemolytic Streptococcus

ROBERT E. FARBER, M.D., M.P.H., and FERDINAND A. KORFF, B.S.

A SUDDEN extensive outbreak of beta hemolytic streptococcal sore throat occurred in Baltimore, Md., during February 1957. The Baltimore City Health Department, investigating the outbreak, found that an estimated 600 individuals became ill following attendance of a charity luncheon by more than 800 people, mostly women.

Several members of the organization which sponsored the luncheon procured and prepared most of the food served. A commercial caterer and a restaurateur assisted in the preparation of some of the food. The menu consisted of egg salad, tuna fish salad, macaroni with cheese, cottage cheese with nuts and cherries, pickles and olives, ice cream, coffee, and cookies.

Epidemiologically, egg salad, the probable vehicle of the outbreak, is of interest because recent literature reveals three instances in which eggs were the vehicle of transmission for streptococcus infection (1-3).

The specific causative organism, group A, type 25, beta hemolytic streptococcus which was recovered from patients, is one of the types of streptococci reported as being nephrotoxic by Rammelkamp and others (4-7).

Epidemiological Studies

A questionnaire was distributed 1 week after the luncheon to as many people who had attended as possible. It soon became apparent

Dr. Farber is director of the bureau of communicable diseases, and Mr. Korff is director of the bureau of food control, in the Baltimore City Health Department, Baltimore, Md.

that it would be impossible to reach all of these people, since there was not a complete roster of the guests.

Because of the incomplete roster and because of the possibility that the questionnaires would be returned primarily by those ill, it was decided to base the epidemiological investigation primarily on the information obtained from the 96 members of the organization.

The questionnaire requested the following information: clinical details of the illness, time of onset of the illness, name of the attending physician, a history of foods eaten at the luncheon, a statement on whether any food had been taken home and, if so, who had eaten it and with what result.

Of the 96 members of the organization 6 had not attended the luncheon and 4 could not be found for questioning. Of the remaining 86 members, 60 had become ill with sore throats, giving an attack rate of 70 percent. Since it is reasonable to assume that the attack rate of this group is unbiased, it follows that of the 800 to 900 who attended the luncheon, some 500 to 600 probably became ill. This figure does not include secondary cases or those who were made ill by food brought home.

Figure 1 gives the frequency distribution in hours of onset of the illness following the luncheon. The shape of the curve, although slightly skewed to the right, is nevertheless consistent with the hypothesis of a common source epidemic.

By plotting the cumulative percentage of cases against the logarithms of the times of onset on normal probability paper (fig. 2) according to the method of Sartwell (8), the

points fall approximately along a straight line in a log normal fashion. From this graph the median incubation is estimated to be 31-32 hours, with 90 percent of the cases occurring within 65 hours following the luncheon. In the Fort Bragg outbreak (1) the estimated median incubation period was 38 hours, and in the Catskill epidemic reported by Sartwell (8) it was 56 hours.

Of the 60 members who became ill, all except 1 had a sore throat; 40, or 66.7 percent, had fever; 32, or 53.3 percent, had headaches; vomiting was reported by 11.5 percent, and 6.7 percent experienced diarrhea. There were no reported instances of a skin rash. There were no fatal cases.

Table 1 summarizes attack rates according to the food histories given by the 86 organization members. The outstanding observation is that, of 65 individuals who ate egg salad, 83 percent subsequently became ill and among the remaining 21 who did not eat egg salad, 29 percent became ill. For each food, the noneaters serve as a control for those who gave a history of

Figure 1. Frequency distribution of persons attacked, by time of onset of illness.

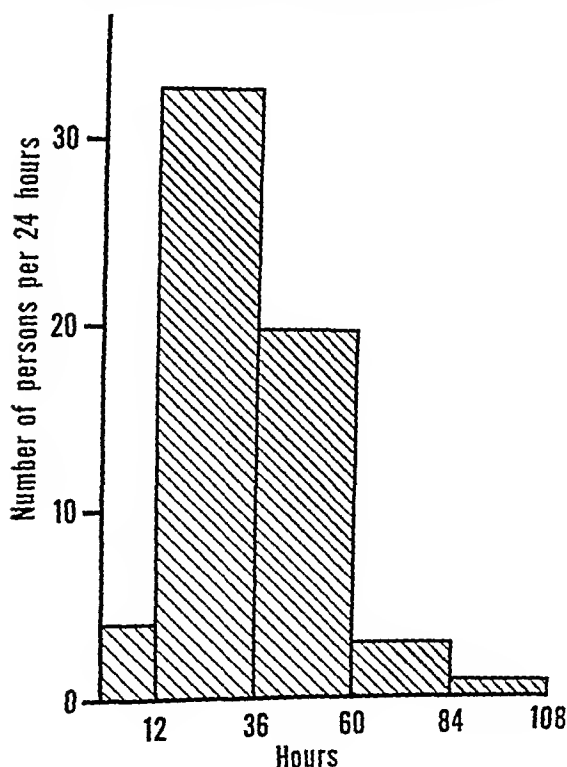
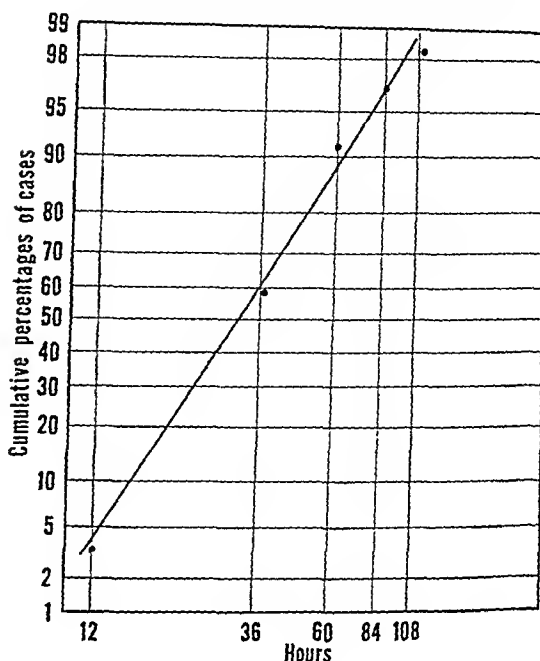


Figure 2. Cumulative distribution of persons attacked, by time of onset of illness.



eating. Where the attack rate differs significantly between the consumers and the nonconsumers, the foodstuff is said to be associated with the illness and is suspect as the vehicle of the illness. In the present investigation, egg salad and tuna fish salad are thus conjectured as possible sources of infection, egg salad showing a far higher association.

A factorial analysis, shown in table 2, indicates that among those who ate tuna fish salad, the attack rate was significantly determined by the consumption of egg salad. However, among those who ate egg salad, a history of tuna fish salad eating was not significant as a determinant of illness. These facts would seem to indicate that egg salad was the vehicle of the illness.

Further support for incrimination of the egg salad is provided by the analysis of the incidence of illness among husbands and other family members who were not in attendance at the luncheon, but who ate the leftover food brought home by the ladies. As shown in table 3, of those who ate the egg salad only, 71 percent became ill; whereas of those who ate the tuna fish salad only, 13 percent became ill. Of those who ate both egg salad and tuna fish salad, 59 percent became ill. There are certain limitations, of course, in this analysis. The in-

Table 1. Attack rates, according to food history

| Food | Persons who ate specified food | | | Persons who did not eat specified food | | | | |
|--------------------------|--------------------------------|------------|-------------|--|------------|-------------|----------|----------------|
| | Total number | Number ill | Percent ill | Total number | Number ill | Percent ill | χ^2 | ¹ P |
| Egg salad..... | 65 | 54 | 83.1 | 21 | 6 | 28.6 | 24.75 | <.01 |
| Macaroni and cheese..... | 34 | 26 | 76.5 | 52 | 34 | 65.4 | .95 | >.05 |
| Cottage cheese..... | 56 | 40 | 71.4 | 30 | 20 | 66.7 | .25 | >.05 |
| Tuna fish salad..... | 63 | 49 | 77.8 | 23 | 11 | 47.8 | 7.02 | <.01 |
| Ice cream..... | 40 | 31 | 77.5 | 46 | 29 | 63.0 | 1.99 | >.05 |

¹ Values shown represent probabilities that observed differences could have occurred by chance. Values of $P < .05$ indicate statistically significant differences.

cidence of illness among members of the households who did not eat the leftover foods was not obtained. This information could have provided an estimate of the expected incidence in the absence of a history of exposure to suspected foods, either due to spread of the agent (secondary cases) or unconnected with the episode.

Investigation of the preparation of the foods strengthened the evidence that the egg salad was the vehicle of spread. The tuna fish salad and cottage cheese had been prepared by the caterer, whereas the egg salad had been prepared by the restaurateur. The tuna fish had been supplied in unopened cans to the caterer, and the mayonnaise was a well-known commercial brand in large unopened gallon jars. The cottage cheese was secured from one of the large milk plants in Baltimore City. The macaroni and cheese had been prepared at the luncheon and served hot.

The raw eggs for the egg salad were obtained from various sources by the ladies of the organi-

zation. In the homes of eight members they were hard-boiled and shelled by the ladies with the help of maids and others on Monday, February 4. The hard-boiled eggs were then collected from these homes and delivered to the restaurateur some time on Tuesday, February 5, the day before the luncheon.

At the restaurateur's, on the evening of February 5, the peeled, boiled eggs were cut by machine and mixed with washed, cut-up celery. The room temperature was said to be between 78° to 82° F. Mayonnaise from the original containers, seasoning, and a quantity of mashed potatoes were added. This mixture was excessively handled, being run through the grinder three times, and then put in plastic bags of approximately 25 pounds each. These were sealed and placed in the restaurant refrigerator for approximately 9 hours at a temperature reported as 34° F. There are indications that this food was not completely chilled until after many hours storage in the refrigerator.

Table 2. Attack rates, comparison of egg salad with tuna fish salad

| Food eaten | Total number | Number ill | Percent ill | P |
|--|--------------|------------|-------------|--------|
| Egg salad without tuna fish salad..... | 12 | 8 | 66.7 | } >.05 |
| Egg salad with tuna fish salad..... | 53 | 46 | 86.8 | |
| Total..... | 65 | 54 | 83.1 | |
| Tuna fish salad without egg salad..... | 10 | 3 | 30.0 | } <.01 |
| Tuna fish salad with egg salad..... | 53 | 46 | 86.8 | |
| Total..... | 63 | 49 | 77.8 | |
| Neither egg salad nor tuna fish salad..... | 11 | 3 | 27.3 | |

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The raw eggs for the egg salad were obtained from various sources by the ladies of the organi-

zation. In the homes of eight members they were hard-boiled and shelled by the ladies with the help of maids and others on Monday, February 4. The hard-boiled eggs were then collected from these homes and delivered to the restaurateur some time on Tuesday, February 5, the day before the luncheon.

At the restaurateur's, on the evening of February 5, the peeled, boiled eggs were cut by machine and mixed with washed, cut-up celery. The room temperature was said to be between 78° to 82° F. Mayonnaise from the original containers, seasoning, and a quantity of mashed potatoes were added. This mixture was excessively handled, being run through the grinder three times, and then put in plastic bags of approximately 25 pounds each. These were sealed and placed in the restaurant refrigerator for approximately 9 hours at a temperature reported as 34° F. There are indications that this food was not completely chilled until after many hours storage in the refrigerator.

Table 2. Attack rates, comparison of egg salad with tuna fish salad

| Food eaten | Total number | Number ill | Percent ill | P |
|--|--------------|------------|-------------|--------|
| Egg salad without tuna fish salad..... | 12 | 8 | 66.7 | } >.05 |
| Egg salad with tuna fish salad..... | 53 | 46 | 86.8 | |
| Total..... | 65 | 54 | 83.1 | |
| Tuna fish salad without egg salad..... | 10 | 3 | 30.0 | } <.01 |
| Tuna fish salad with egg salad..... | 53 | 46 | 86.8 | |
| Total..... | 63 | 49 | 77.8 | |
| Neither egg salad nor tuna fish salad..... | 11 | 3 | 27.3 | |

for plating in 24 hours. The organisms isolated were tested for biochemical reactions and in the case of the pigmented staphylococci, the Stone's agar and coagulose reactions were tested.

Beta hemolytic streptococci were not isolated from any of the food samples, but the egg salad was heavily contaminated with *Escherichia coli*; hemolytic, pigmented staphylococci; and alpha streptococci. From the cottage cheese a hemolytic pigmented staphylococcus and an alpha streptococcus were isolated. Only an alpha streptococcus was isolated from the tuna fish salad.

Four weeks after the luncheon 9 throat cultures were taken at random from 9 women who had had acute sore throats following the luncheon. Of these, three were positive for a group A, type 25, beta hemolytic streptococcus. At the time the cultures were taken, all of these ladies were asymptomatic and had apparently fully recovered from their acute illness. None of the nine had been cultured previously in the investigation.

Thus, group A, type 25, beta hemolytic streptococci were isolated from 3 of 6 attendants at the luncheon who were cultured 2 days later, from all 3 food handlers cultured 5 days after the luncheon, who prepared the egg salad, and from 3 of 9 attendants at the luncheon who were cultured 4 weeks later.

Complications

Since the causative organism, group A, type 25, beta hemolytic streptococcus, had been cited as being nephrotoxic, a survey was initiated to estimate the frequency of nephritic as well as other complications. The survey was timed to coincide with the maximum time interval between the acute sore throat and the onset of possible nephritis, that is, 21-28 days (9). Physicians practicing in the area where the majority of the patients lived were questioned and alerted to this possibility. Questionnaires were sent to 47 of the physicians known to have treated some of the patients. Of these, 33 responded and reported that they had treated a total of 310 patients. None of these patients was reported to have had any signs of nephritis within 5 weeks after the acute attack; 51 of the 310 had recurrences of sore throat after ap-

parent initial recovery. Other complications reported were 3 cases of sinusitis and 3 cases of otitis media.

In addition to the questionnaires to the physicians, single urine specimens were obtained by the public health nurses of the Baltimore Health Department from 97 of the ladies, including members and nonmembers, who had had sore throats. The specimens were obtained during the fourth week following the acute illness. These 97 specimens were tested within 6 hours of collection for the presence of albumin and red blood cells. All of the tests were negative except one which showed a two-plus albumin and 1 to 2 red blood cells per high-power field. In this latter case, the patient's personal physician was contacted and his further investigation revealed no evidence of nephritis.

Discussion

The estimated primary attack rate for this foodborne streptococcus outbreak, 69.8 percent, was high compared with other reported outbreaks. The Fort Bragg attack rate was 41.7 percent, of which 91 percent were primary cases and 9 percent were carriers (1). There are several possible explanations for this difference. The causative organism in the present outbreak may have been new to this community so that the number of previously immune individuals was low. Since the typing of streptococci is a recently adopted procedure and not regularly performed, there is no evidence to refute or substantiate this possibility.

A more likely possibility derives from the fact that both the health department investigators and the private physicians gained the impression that several of the so-called patients were not truly infected but merely had psychosomatic complaints. In addition, the fact that only two-thirds of the reported patients had fever seems unusually low for streptococcal sore throat and therefore supports this contention.

Consistent epidemiological evidence suggests egg salad was the vehicle for the disease: first, the epidemic curve indicated that the reported disease was due to a common vehicle; second, the analysis of attack rates according to foods

Table 3. Attack rates, not present at luncheon but eating food brought home

| Food taken home | Number eating food | Number ill | Percent ill |
|------------------------------------|--------------------|------------|-------------|
| Egg salad only..... | 38 | 27 | 71.1 |
| Tuna fish salad only..... | 15 | 2 | 13.3 |
| Egg salad and tuna fish salad..... | 21 | 12 | 57.1 |

Upon investigation of the food handlers at the restaurateur's where the egg salad had been prepared, it was discovered that one of them had been examined at a local hospital for severe cellulitis of his left hand on February 7, the day following the luncheon and 2 days following the preparation of the egg salad. The following is an abstract of his hospital outpatient record:

Present illness: Patient states that on several occasions he has had pus pimples on his hands. This time, the present episode began yesterday, and his left hand became swollen and sore. There are also pus pimples on the right hand.

Physical examination: Discloses erythema and edema of fingers of the left hand, and also hand itself is edematous. Increased temperature in area. Linear red streak up the flexor surface of left forearm and up the arm into the left axilla where there is a large axillary adenitis present.

Diagnosis: Pustular dermatitis, both hands; cellulitis, left hand; lymphangitis, left arm; lymphadenitis, left axilla.

No cultures from the food handler were taken at the hospital. Cultures from this man's hand and throat were subsequently obtained in the Baltimore City Health Department on February 11, 6 days after the preparation of the egg salad. In addition, throat cultures and hand cultures were taken on February 11 from 2 other food handlers who likewise were involved in the preparation of the egg salad. The report on these cultures will be discussed under the laboratory findings.

The food handler with cellulitis insisted that his hands were normal at the time of the preparation of the egg salad and that they did not become sore until 24 hours later. This fact is borne out in the above abstract from the hospital record where it is clearly stated that the infection of the hands began "yesterday," that

is, on February 6, the day after preparation of the egg salad. This information in the hospital record was given before there was any suspicion that a foodborne epidemic was involved. The previous occurrences of "pus pimples," according to the food handler, followed exposure to mayonnaise, vinegar, and certain detergents. They may have represented contact dermatitis.

Laboratory Findings

Six throat cultures were obtained from patients who had attended the luncheon. Four of these were taken by the health officer and two by a private physician on February 8, 2 days after the luncheon. These cultures were examined in the laboratories of the Baltimore City Health Department and typed at the Johns Hopkins School of Hygiene and Public Health. Five cultures were reported to have grown beta hemolytic streptococcus, group A, using the Taxos disk method. From the sixth culture an alpha streptococcus and a hemolytic, pigmented, coagulose positive staphylococcus were isolated. Further typing of the group A culture indicated that 3 of the 5 were type 25; one was untypable and the fifth culture was group C instead of the originally thought group A.

Throat cultures taken on February 11 from the 3 food handlers who had prepared the egg salad showed beta hemolytic streptococci, which were later typed as group A, type 25. It is of interest that the food handler with cellulitis of the left hand still had a positive throat culture in spite of 3 intramuscular injections of 600,000 units of penicillin, given on February 7, 8, and 11.

Cultures from the hands of these food handlers, including the one with cellulitis, were negative for beta hemolytic streptococci.

Bacteriological examinations of the samples of the egg salad, tuna fish salad, and cottage cheese were done as follows: 10 grams of each were emulsified in 90 cc. of sterile buffered distilled water. Serial dilutions were made and plated for total and coliform counts. A tenth of a cubic centimeter of the emulsion was plated on Teague's EMB, blood, tellurite glycine, and desoxycholate lactose saccharose citrate agars. Selenite enrichment broth was also inoculated

for plating in 24 hours. The organisms isolated were tested for biochemical reactions and in the case of the pigmented staphylococci, the Stone's agar and coagulose reactions were tested.

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Consistent epidemiological evidence suggests egg salad was the vehicle for the disease: first, the epidemic curve indicated that the reported disease was due to a common vehicle; second, the analysis of attack rates according to foods

consumed implicates egg salad as the determinant of the sore throat; third, the analysis of attack rates among those who ate food brought home from the luncheon also points to the egg salad; and fourth, the causative organism was isolated from the throats of the food handlers who prepared the egg salad. The failure to isolate the organism from the egg salad may perhaps be explained by the fact that at the time food samples were cultured, the egg salad was at least 72 hours old, and the eggs themselves had been shelled approximately 96 hours. Presumably, any beta hemolytic streptococci that might have been present could have been overgrown with other organisms.

The inability to find the causative organism in the vehicle demonstrates the need for epidemiological investigation of all illnesses attributed to food, and the inherent limitations in inferences based solely upon the results of analyses of residues of food served. Food available for examination following any outbreak of illness is food that has not been eaten, and unless of liquid consistency a negative finding cannot be considered to refute the epidemiological findings.

The means by which the egg salad was contaminated pose an interesting question. If we accept the possibility that the man with cellulitis was a victim rather than the initiator of the outbreak, then we must look elsewhere for the mode of infection of the egg salad.

Any one of the ladies, or their maids and other helpers, who helped to prepare the eggs could have been a carrier of the streptococcus and could have coughed or sneezed inadvertently over her pile of shelled hard-boiled eggs. If the eggs were so inoculated and improperly refrigerated overnight in the ladies' homes, an ample growth of streptococci could have been present the next day when the eggs were delivered to the restaurateur.

The food handler could have been infected when he was putting the eggs through the cutting machine. An attempt to test this hypothesis was made. All the ladies involved in the preparation of the eggs were questioned, but they denied any infection or illness prior to the luncheon either in themselves or in members of their families. Of these 8 ladies all but 2 became ill 24 to 48 hours after the luncheon.

In addition, absentee records of schools in the vicinity were examined for evidence of sore throats. The only apparently pertinent information thus obtained was that the young son of one of the members was sick with a sore throat and fever 4 days before the luncheon. Investigation of this lead revealed that the whole family except the mother had been sick. The mother however could not be connected with the preparation of the eggs or any of the other foods served.

The positive throat cultures from the 3 food handlers at the restaurateur's taken on February 11, 1957, 5 days after the luncheon, could be explained by the assumption that each of these men sampled the egg salad during and after mixing. Investigation of this possibility revealed that two of the food handlers tasted some of the egg salad; the third could not be reached. Consequently, the question again arises whether these positive throat cultures are cause or effect.

Conclusions from the failure to find evidence of nephritis in 97 subjects must be guarded. A single urine specimen is not wholly adequate to rule out this condition, even when taken at approximately the time when nephritis would be expected to be present. The negative information secured from physicians treating over 300 patients must also be interpreted with caution. We may at least say, however, that the incidence of nephritis, if it occurred, was low. Only two cases of nephritis have been reported in the literature in association with type 25 streptococcus.

Apparently the secondary attack rate for this outbreak was low. Those private physicians who were questioned reported very few cases in other members of the families or the community except among those who ate the food served at the luncheon. Likewise, a review of the causes of absence from the schools in the area showed no marked increase in the number of acute sore throats. One possible explanation for the low secondary attack rate is the fact that many of the private physicians in the area gave routine prophylactic antibiotics to contacts of the primary cases. However, secondary attack rates appear to have been low in other foodborne streptococcal epidemics before antibiotics were used.

Even after taking into account the use of effective antibiotic therapy, the cases in this epidemic were impressively mild as contrasted with those of an earlier era when septic sore throat was attended by a considerable number of suppurative complications and a substantial mortality. This is consistent with the long-time trend toward reduced clinical severity of scarlet fever and, presumably, respiratory streptococcal infections.

Summary

In February 1957 a foodborne outbreak of streptococcal sore throat, estimated to have caused over 500 illnesses, occurred in Baltimore, Md. The attack rate was 70 percent among the 86 persons studied. The causative organism was a group A, type 25, beta hemolytic streptococcus.

Epidemiological investigation suggests that egg salad served at a luncheon was the vehicle, 83 percent of those who ate the food reporting illness. The source of the infection was not ascertained.

Although the search for nephritic complications was limited, no evidence was found to support reports of the nephrotoxic potential of this streptococcal type.

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The Biophysical Society

The first national meeting of the Biophysical Society was held at the Massachusetts Institute of Technology in Cambridge, Mass., during February 5-7, 1958.

Founded in March 1957 in Columbus, Ohio, the society has defined its aim as the promotion of "a more complete biological science with emphasis on mathematically formalized theory and quantitative experimentation." The group hopes to achieve this goal by welding into a new scientific team experts from such fields as physics, biology, medicine, chemistry, mathematics, and engineering.

Intensively studied at the 1958 meeting were aspects of molecular biophysics, particularly microsomal particles and protein synthesis, and muscle proteins and contractile mechanisms. Papers were presented by specialists drawn from the United States and abroad with the assistance of the National Science Foundation.

TPI and TPCF Tests On 2,000 Patients Difficult to Diagnose

AD HARRIS, VIRGINIA H. FALCONE, B.S., LEWIS S. PRICE, and WILLIAM J. BROWN, M.D.

SINCE January 1, 1955, the Venereal Disease Research Laboratory of the Public Health Service has offered a *Treponema pallidum* immobilization (TPI) testing service on a nationwide basis to all physicians through the laboratories of State and Territorial departments of health. The Venereal Disease Research Laboratory has received from State laboratories requests for TPI testing of approximately 100 serums per week since commencement of the service (1, 2). During a part of this period, the *Treponema pallidum* complement fixation (TPCF) test also was used—experimentally and as a research tool. From July to December 1956, both these procedures were used on all serums submitted for TPI testing, and in January 1957 the TPCF test was made an integral part of the TPI testing service.

All serums submitted for TPI testing have been tested first with the TPCF procedure since January 1957. Only those serums that are not nonreactive in the TPCF test are then tested with the TPI procedure. When both tests are performed, the completed report identifies each test by name and lists the results obtained in each.

This report presents analyses of results obtained with TPI and TPCF tests on 2,000 serums tested during the period from July to December 1956, when all serums were being tested with both procedures, and relates these findings to the patient data and medical opin-

ions submitted with the serums. Serums were received from more than 1,300 physicians in 47 States and Territories, so they probably represent a fair cross section of the diagnostic-problem patients of the average physician. The patients included 1,255 females (62.75 percent) and 745 males (37.25 percent). This percentage distribution by sex is approximately the same as has been noted since the TPI testing service was introduced, and it may indicate that the diagnostic problem in regard to syphilis is occurring approximately twice as often in female as in male patients (3).

Methods

Serums. Specimens submitted for TPI testing service are received from the State and Territorial departments of health laboratories, accompanied by completed clinical data sheets. The clinical data sheet, in addition to identifying the patient, lists blood and spinal fluid test reports, any history of treponematoses and treatment given, history of several conditions or infections known to be associated with biologic false-positive (BFP) reactions, and finally, the opinion of the attending physician as to the probable diagnosis of the patient at the time the blood is submitted. The stipulations for the acceptance of specimens for this service are that they be sterile serums from diagnostic-problem patients with no history or clinical evidence of syphilis or with suggestive evidence of untreated syphilis.

TPI Test. The TPI test was performed according to the Nelson technique (4, 5) as modified in later publications by the Venereal Disease Research Laboratory (6-9). Only those serums which, after treatment with penicillinase, produced less than 70 percent motility in the control tube were reported as inconclusive.

TPCF Test. The qualitative TPCF test was performed according to the technique described by Portnoy and Magnuson (10). Antigen was obtained from the Venereal Disease Experimental Laboratory, Chapel Hill, N. C. An anticomplementary report was recorded on those specimens that were anticomplementary in qualitative testing and insufficient in quantity to allow preparation of dilutions for retesting as prescribed in the technique.

Mr. Harris is director, Mrs. Falcone is a bacteriologist, and Mr. Price is administrative officer, Venereal Disease Research Laboratory, Venereal Disease Branch, Communicable Disease Center, Public Health Service, Chamblee, Ga. Dr. Brown is chief of the Venereal Disease Branch, Communicable Disease Center, Atlanta, Ga.

Discussion

Specific test results obtained with the TPI and TPCF tests on 2,000 serums (745 from male patients and 1,255 from female patients) are shown in table 1. Several observations may be made from these data. The TPCF test was slightly more reactive for this donor group than was the TPI test. Although 42.5 percent were reactive to the TPCF, while 47.7 percent were reactive to the TPI test, the reactive plus weakly reactive results totaled 51.0 percent for the TPCF and only 49.8 percent for the TPI test. Conversely, the percentage of nonreactive findings was greater with the TPI test (50 percent) than with the TPCF test (48 percent). The percentage of nonreactive results in both tests was higher for serums from females (TPI 54.4 percent and TPCF 51.2 percent) than for the specimens from males (TPI 42.6 percent and TPCF 42.7 percent). As indicators of probable false-positive reactions in other tests for syphilis, the nonreactive results in these tests suggest that the proportion of probable biologic false-positive reactors is higher in female than in male patients.

Only 20 (1 percent) of the 2,000 serums were reported as anticomplementary in the TPCF test (see "Methods") and only 3 serums (0.2

percent) were reported inconclusive in the TPI test.

Actual agreement between the results obtained with the TPI and TPCF tests is not as great as is indicated by the total percentage of reactive plus weakly reactive results for the two tests. One hundred and one serums (5.0 percent) that were nonreactive in the TPCF test produced reactive or weakly reactive results in the TPI test. One hundred and thirty-one serums (6.5 percent) that produced nonreactive results in the TPI test were either reactive or weakly reactive in the TPCF test. Direct disagreement of results obtained with the two tests was produced, therefore, in 11.5 percent of the 2,000 specimens. Inclusion of anticomplementary and inconclusive findings brings the non-agreement total to 12.7 percent.

Complete serologic agreement of these two tests was obtained in 1,745 (87.3 percent) of the serums in the series. Both tests were reactive or weakly reactive in 887 (44.4 percent), and both were nonreactive in 858 (42.9 percent) of the specimens tested.

Since the TPCF test is now being used as a screening procedure for the TPI testing service, the 101 serums showing nonreactive results in the TPCF test but with some degree of reactiv-

Table 1. Comparative results of TPI and TPCF tests on 2,000 serums

| Type of reaction | | TPI test | | | | | | | | | |
|------------------|------------------------|----------|----------|----------|----------|-----------------|----------|-------------|----------|--------------|----------|
| | | Total | | Reactive | | Weakly reactive | | Nonreactive | | Inconclusive | |
| | | Num-ber | Per-cent | Num-ber | Per-cent | Num-ber | Per-cent | Num-ber | Per-cent | Num-ber | Per-cent |
| TPCF Test | Both sexes----- | 2,000 | 100.0 | 956 | 47.7 | 41 | 2.1 | 1,000 | 50.0 | 3 | 0.2 |
| | Reactive----- | 851 | 42.5 | 781 | 39.0 | 8 | .4 | 61 | 3.0 | 1 | .1 |
| | Weakly reactive----- | 169 | 8.5 | 93 | 4.6 | 5 | .3 | 70 | 3.5 | 1 | .1 |
| | Nonreactive----- | 960 | 48.0 | 74 | 3.7 | 27 | 1.3 | 858 | 42.9 | 1 | .1 |
| | Anticomplementary----- | 20 | 1.0 | 8 | .4 | 1 | .1 | 11 | .6 | | |
| | Males----- | 745 | 100.0 | 417 | 56.0 | 10 | 1.3 | 317 | 42.6 | 1 | .1 |
| | Reactive----- | 364 | 48.9 | 344 | 46.2 | 2 | .3 | 18 | 2.4 | | |
| | Weakly reactive----- | 56 | 7.5 | 37 | 5.0 | 1 | .1 | 18 | 2.4 | | |
| | Nonreactive----- | 318 | 42.7 | 35 | 4.7 | 6 | .8 | 276 | 37.1 | 1 | .1 |
| | Anticomplementary----- | 7 | .9 | 1 | .1 | 1 | .1 | 5 | .7 | | |
| | Females----- | 1,255 | 100.0 | 539 | 43.0 | 31 | 2.5 | 683 | 54.4 | 2 | .1 |
| | Reactive----- | 487 | 38.8 | 437 | 34.8 | 6 | .5 | 43 | 3.4 | 1 | .1 |
| | Weakly reactive----- | 113 | 9.0 | 56 | 4.5 | 4 | .3 | 52 | 4.1 | 1 | .1 |
| | Nonreactive----- | 642 | 51.2 | 39 | 3.1 | 21 | 1.7 | 582 | 46.4 | | |
| | Anticomplementary----- | 13 | 1.0 | 7 | .6 | | | 6 | .5 | | |

Table 2. Medical data supplied with 101 serums nonreactive in TPCF and reactive or weakly reactive in TPI tests

| Diagnostic category and sex | Total | History of syphilis | No history of syphilis |
|--------------------------------|-------|---------------------|------------------------|
| All diagnostic categories..... | 101 | 24 | 77 |
| Males..... | 41 | 9 | 32 |
| Females..... | 60 | 15 | 45 |
| Syphilis..... | 18 | 12 | 6 |
| Males..... | 9 | 5 | 4 |
| Females..... | 9 | 7 | 2 |
| Biologic false positive..... | 71 | 9 | 62 |
| Males..... | 28 | 3 | 25 |
| Females..... | 43 | 6 | 37 |
| None stated..... | 12 | 3 | 9 |
| Males..... | 4 | 1 | 3 |
| Females..... | 8 | 2 | 6 |

ity in the TPI test are of most interest. Table 2 shows that these serums were from 18 patients considered to be syphilitic, 71 patients considered to be biologic false-positive reactors, and 12 patients for whom no clinical opinion had been given. The group includes 24 patients with some history of syphilitic infection and 77 patients without positive history or physical findings of infection. Distribution in this group as to sex, history of previous syphilitic infection, and present diagnosis is not unlike

that in the remainder of the 2,000 patients in this study. One significant difference noted of this group, however, was the number of weakly reactive TPI test results. Twenty-five (25 percent) of these 101 serums produced weakly reactive TPI test findings as compared with only 41 (2 percent) of the total 2,000 serums tested.

Seventeen hundred and fifty-four of the serums were accompanied by data sheets indicating the clinical impression of the submitting physician as to whether the patient was a biologic false-positive reactor or had syphilis. Comparisons of test results obtained on specimens in these two categories are presented in tables 3 and 4. No clinical opinion was indicated on the data sheets for the remaining 246 serums.

Of the 1,407 serums from patients listed as probable biologic false-positive reactors (table 3), 47 percent were nonreactive to both the TPI and TPCF tests. Results from either test alone were in slightly closer agreement with the medical opinion that these specimens were from BFP reactors, since 54.3 percent nonreactive results were obtained with the TPI test and 52.0 percent were produced in the TPCF test. Of the 1,407, 40.3 percent were either reactive or weakly reactive in both the TPI and TPCF tests. The group of specimens from females showed closer agreement with medical opinion

Table 3. Comparison of TPI and TPCF test results on 1,407 serums from patients diagnosed biologic false-positive reactors

| Type of reaction | TPI Test | | | | | | | |
|----------------------------------|----------|---------|-----------------------------|---------|-------------|---------|--------------|---------|
| | Total | | Reactive or weakly reactive | | Nonreactive | | Inconclusive | |
| | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| Both sexes..... | 1,407 | 100.0 | 643 | 45.6 | 762 | 51.3 | 2 | 0.1 |
| Reactive or weakly reactive..... | 661 | 47.0 | 567 | 40.3 | 92 | 6.6 | 2 | .1 |
| Nonreactive..... | 732 | 52.0 | 71 | 5.0 | 661 | 47.0 | | |
| Anticomplementary..... | 14 | 1.0 | 5 | .3 | 9 | .7 | | |
| Males..... | 492 | 100.0 | 268 | 54.5 | 224 | 45.5 | | |
| Reactive or weakly reactive..... | 263 | 53.5 | 239 | 48.6 | 24 | 4.9 | | |
| Nonreactive..... | 224 | 45.5 | 28 | 5.7 | 196 | 39.8 | | |
| Anticomplementary..... | 5 | 1.0 | 1 | .2 | 4 | .8 | | |
| Females..... | 915 | 100.0 | 375 | 41.0 | 538 | 58.8 | 2 | .2 |
| Reactive or weakly reactive..... | 398 | 43.5 | 328 | 35.9 | 68 | 7.1 | 2 | .2 |
| Nonreactive..... | 508 | 55.5 | 43 | 4.7 | 465 | 50.8 | | |
| Anticomplementary..... | 9 | 1.0 | 4 | .4 | 5 | .6 | | |

Table 4. Comparison of TPI and TPCF test results on 347 serums from patients diagnosed as syphilitic

| Type of reaction | TPI Test | | | | | | | |
|----------------------------------|----------|---------|-----------------------------|---------|-------------|---------|--------------|---------|
| | Total | | Reactive or weakly reactive | | Nonreactive | | Inconclusive | |
| | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| Both sexes..... | 347 | 100.0 | 233 | 67.2 | 113 | 32.5 | 1 | 0.3 |
| Reactive or weakly reactive..... | 237 | 68.3 | 214 | 61.7 | 23 | 6.6 | | |
| Nonreactive..... | 108 | 31.1 | 18 | 5.2 | 89 | 25.6 | 1 | .3 |
| Anticomplementary..... | 2 | .6 | 1 | .3 | 1 | .3 | | |
| Males..... | 164 | 100.0 | 109 | 66.5 | 54 | 32.9 | 1 | .6 |
| Reactive or weakly reactive..... | 110 | 67.1 | 100 | 61.0 | 10 | 6.1 | | |
| Nonreactive..... | 53 | 32.3 | 9 | 5.5 | 43 | 26.2 | 1 | .6 |
| Anticomplementary..... | 1 | .6 | | | 1 | .6 | | |
| Females..... | 183 | 100.0 | 124 | 67.7 | 59 | 32.3 | | |
| Reactive or weakly reactive..... | 127 | 69.4 | 114 | 62.3 | 13 | 7.1 | | |
| Nonreactive..... | 55 | 30.1 | 9 | 4.9 | 46 | 25.2 | | |
| Anticomplementary..... | 1 | .5 | 1 | .5 | | | | |

than specimens from males. Nonreactive results were produced by TPI in 58.8 percent, and by TPCF in 55.5 percent of the serums from female donors, whereas each test produced nonreactive results in 45.5 percent of the serums from males. This may reflect some factor, present in the female, that is responsible for an increased percentage of BFP reactions.

Of the 347 specimens from patients currently diagnosed as syphilitic (table 4), 61.7 percent were reactive or weakly reactive in both tests, while 25.6 percent were nonreactive in both tests. Again slightly closer agreement with medical opinion was shown by the results of each test considered independently, since 67.2 percent reactive results were produced in the TPI test and 68.3 percent were obtained in the TPCF test. Here no significant difference between reactivity in either test of serums from male and female donor groups was noted.

Approximately 5 percent of the serums in this study produced TPI reactions (reactive or weakly reactive) and would have been missed if the TPCF nonreactive serums had not been tested further. However, 6.5 percent of the serums were reactive or weakly reactive in the TPCF test and produced nonreactive findings in the TPI test. It is estimated from these bases that the TPCF test, when used as a screening procedure for the TPI test, may detect (in-

cluding anticomplementary findings) approximately 90 percent of the serums that will produce reactive or weakly reactive findings in the TPI test, although a larger total number of reactive plus weakly reactive TPCF test results may be obtained. The percentage of agreement between results obtained with the TPI and TPCF tests reported here would not necessarily be similar to findings produced by testing groups of specimens selected in a different manner.

Summary

Results obtained with the TPI and TPCF tests on 2,000 serums from diagnostic-problem patients were in agreement on 1,745 serums (87.3 percent).

The greater proportion of nonreactive results produced by serums from female patients in both or either of the treponemal tests is an indication that biologic false-positive reactions may be more prevalent among female patients.

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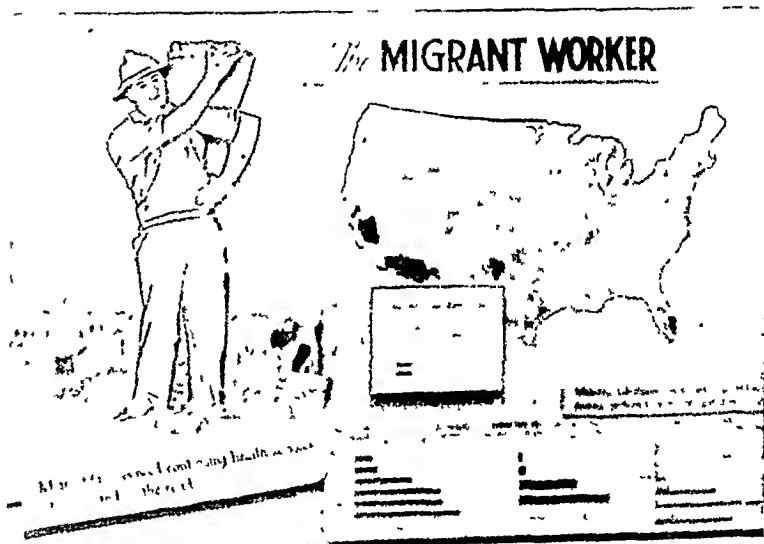
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PHS exhibit

The Domestic Migrant Worker

To encourage community effort in meeting the health problems of domestic agricultural migrants on a continuing basis, information is supplied through a Public Health Service exhibit.

The exhibit consists of maps, charts, and photographs, illustrating the major routes traveled, important work areas, typical housing, and health conditions. It gives examples of organized effort in making health services available to the migrants who follow the crops each year. The exhibit is designed for display at national, regional, and State conferences, and in other places where interested people gather together.



Specifications: A 3-panel exhibit on legs, 7 feet high, total weight 377 lbs., including the packing crate; back panel, 4' x 6'; each of the side panels, 4' x 3', attached to the center by hinges. Lighting fixtures fit into each of the panels through slots at the top, and the three 150-watt reflector floodlights can be connected with a single outlet. Available through the Division of General Health Services, Public Health Service, U. S. Department of Health, Education, and Welfare, Washington 25, D. C.

are we getting public health in tune with the times?

"Be they pessimists or optimists, public health workers everywhere agree that these are times of change and that the future of public health is either beset with or holds promise of unprecedented challenge. Fortunately, there is today a ferment in public health. . . . The frustrations, the disappointments, the dissatisfactions and discontentments are, in my opinion, the precious yeast so essential to constructive ferment. They are basic to the evolution of new knowledge and new understanding which can lead to greater attainment. . . . Although science can show us how to achieve our ends, it is a sobering fact, but a heartwarming and human one, that for motivation and purpose we must seek guidance elsewhere—in faith, in fellowship, in our relationships, and in our public policy pronouncements. It is in guidance in these all-important areas that our Association has the potential for serving us so well."

JOHN W. KNOTSON, D.D.S., Dr.P.H.
President, American Public Health Association
From the presidential address at the
Eighty-fifth annual meeting, November 11, 1957

SUMMARIES OF SELECTED PAPERS
from the 85th annual meeting
of the
AMERICAN PUBLIC HEALTH ASSOCIATION
and related organizations
held at Cleveland, Ohio
November 11-15, 1957

The APHA Conference Report



With the assistance and cooperation of the authors, the staff of *Public Health Reports* has summarized some 70 of the papers presented at the 85th annual meeting of the American Public Health Association and related organizations in Cleveland, Ohio, November 11-15, 1957.

Summaries selected for publication in the following pages are intended to present information which may not otherwise have been given adequate notice. Omitted from these selections are papers which were known to have been scheduled for early publication in the *American Journal of Public Health*; papers whose authors provided no copies for this

journal; and papers which, for one reason or another, did not seem suited to summarization.

No papers on laboratory methods are summarized here because of the understanding that they would have early publication, at least in brief form, in the APHA journal.

Other papers presented at the conference are under consideration for publication in subsequent issues of *Public Health Reports*. The February issue carried papers given at the meeting of the health officers section with the American College of Preventive Medicine.

Names of sections and some of the affiliated organizations represented at the conference are listed below.

Sections of the American Public Health Association

Dental Health
Engineering and Sanitation
Epidemiology
Food and Nutrition
Health Officers

Laboratory
Maternal and Child Health
Medical Care
Mental Health

Occupational Health
Public Health Education
Public Health Nursing
School Health
Statistics

Related Organizations Participating in the Conference

Associations

American Association of Hospital Consultants
American Association of Public Health Physicians
American Association of Registration Executives
American Industrial Hygiene Association
American School Health Association
American Society of Professional Biologists

Association of Business Management in Public Health
Association of Labor Health Administrators
Association of State Maternal and Child Health and Crippled Children's Directors
Association of Teachers of Preventive Medicine
Industrial Medical Association
Public Health Cancer Association

Conferences

Municipal Nurse Directors

Municipal Public Health Engineers
Public Health Veterinarians
State and Provincial Public Health Laboratory Directors
State Sanitary Engineers

Other

American College of Preventive Medicine
The Biometrics Society (Eastern North American Region)
National Citizens Committee for the World Health Organization

Current Needs . . .

Effective Health Department Uses Community Resources

Observing that health officers generally consider the community or the political subdivision they serve as their patient, Dr. Ellis D. Sox, director of public health for the city and county of San Francisco, touched briefly on current administrative needs.

Most important, said Sox, we must remove from our thinking the effects of "ancestor worship" and make administration a moving and changing force toward the solution of public health problems of every community, every State, and the Nation.

Motivation of the patient—the community, that is—to accept recommended treatment and the ability of the health officer as administrator to use all necessary resources in the most effective and efficient manner possible are two other important factors, according to Sox. He believes that the health officer must use more and more of the skills currently used by private industry and business in order to make his official activities effective.

In creating recognition among the public of needs for corrective action, the health officer must adopt the techniques of modern communications, he advised. To achieve recognition and correction of such public health problems as poor mental health, alcoholism, and suicides, he must use also the information and know-how available from specialists in sociology, cultural anthropology, and economics.

Sox advocated the substitution of an authoritative approach for an authoritarian approach "so that the health officer may more effectively cooperate with law enforcement agencies, traffic enforcement agencies, urban renewal agencies, planning commissions, and rehabilitation and employment services."

This approach is not strictly that of the scientist, unless it be the social scientist, he said.

Conflict of Interests Demands New Approach

Unlike the communicable diseases, many modern public health problems raise a conflict between protection of the public health on the one hand and the uses of modern technology on the other, or, what is even more complex, a conflict among various public health interests, according to Frank M. Stead, chief of the division of environmental sanitation, California State Department of Public Health.

In the first category he listed medical, research, and industrial uses of nuclear energy; insecticides "so powerful that a few ounces are capable of killing all the insects in an acre of land"; and air pollution, particularly smog, the byproduct of petroleum when it is burned as fuel.

As an example of the second type Stead mentioned the various uses of water. "Outdoor recreation on water is a public health asset," he observed, "yet at the same time recreational use of water supply reservoirs runs counter to the classical principle of giving the highest possible protection to domestic water supplies. Reclamation of sewage to conserve both water and organic material could greatly reduce the pollutional load on streams and salt water recreational areas, but the re-use of such water and organic material carries with it public health risks. . . ."

Modern hazards cannot always be attacked as unmixed evils, Stead emphasized.

The solution lies in the highest possible degree of reconciliation of opposing interests, if they are valuable to society, asserted Stead.

It has been a reasonable policy to seek eradication of communicable

diseases, such as smallpox, plague, typhoid fever, malaria, and syphilis. But the practical value of radiation, insecticides, or materials causing atmospheric pollution is such that it is not wise to seek complete eradication of these hazards if that were possible. The end to be sought, he said, is control, rather than absolute protection. As a result, public health agencies today are deeply engaged in complex evaluation and planning.

Population Increases, Shifts Dictate New Activities

Implications of population changes, such as the increase in the oldest and youngest age groups, the geographic irregularity of the increases, and the rural-urban shifts, were discussed by Dr. John J. Hanlon, director of public health services of the city of Philadelphia and chairman of the department of preventive medicine and public health, Temple University School of Medicine.

These changes, he said, have occurred "with dramatic suddenness and with all the subtlety of a sledge hammer." Hanlon mentioned as outstanding for public health consideration the following items, none of them new, he said, but all deserving emphasis.

- The vast swarm of children appearing demands reevaluation, revamping, and extension of a number of activities, such as the well-child clinics and school health education.

- The growing number and proportion of individuals of advanced age dictates a change in thoughts and activities and development of truly fruitful services and facilities for this group. Above all, it is necessary to discard the idea that senility, infirmity, and incapacitation are synonymous with aging.

- The shrinking size of the middle age groups, the most productive social component, and the growing disparity between men and women in length of life suggest specific,

concerted attention to the wage-earning male.

All of these and other problems, Hanlon asserted, emphasize the need for serious effort to improve the quantity, quality, and distribution of personnel and facilities required to serve these needs.

For public health and medical training, Hanlon suggested that the cost of schools be shared through support not only by the Federal and State governments but also more and more by industry. He believes such sharing is fully justified, first, because the schools actually serve regional, national, and, indeed, international interests; second, because of the increased range of movement of the population; and third, because the schools serve what is now essentially an industrial culture.

With these and other factors in mind, Philadelphia is currently experimenting with standards and formulas for more exactly determining and measuring needs and priorities, Hanlon reported.

Community Organization, Key to Health Progress

Effective community organization is a key to progress in community health, according to views expressed by Sewall Milliken, department of public health, Yale University.

Starting with the premise that the "most crucial problem today is the ever-widening cultural lag between scientific health knowledge and the application of this knowledge by communities," Milliken emphasized community organization as a corrective method.

The three main ingredients in community health progress are research, education, and service, he said, explaining that keeping these three properly related is the job of community organization.

Milliken pointed out further that community health groups are usually coordinated by one or more professional health groups or voluntary or official agencies who have initiative.

As examples of sound community organization, Milliken mentioned the Cincinnati Health Federation, the Cleveland Health Council, and the Metropolitan Health Council of Columbus, three of the oldest community health councils. Such councils provide the setting and the opportunity for professional groups, voluntary and official agencies, and hospitals and other institutions to participate in cooperative health evaluation and planning, he said.

There is great need, according to Milliken, to inject this health council experience into curriculums and training courses to prepare individuals for specialized executive, administrative, and educational work.

Too often in the past, health programs have been established on the basis of personal opinion or hasty observation, he noted. In too many communities no money is set aside for fact finding and for systematic evaluation of future needs and developments.

Milliken believes that communities must devote time and money to fact finding and to studies of health needs and resources. The many demographic changes alone necessitate such action, he contended.

States and Localities Lag in Research

State and local health departments are not contributing adequately to progress in public health through research, contended Dr. Albert V. Hardy, director of the bureau of laboratories, Florida State Board of Health.

Few State or local health departments are approaching today's needs in the spirit of investigation that brought success in the control of communicable diseases, he said. In contrast to the activities of those concerned with the individual patient, Hardy observed little vigor in public health research by State and local health departments, which are experienced in the study of populations and which have ready access

to communities. The result is a lack of adequate evidence to develop a distinctive public health approach to modern conditions.

Hardy pointed out that the Federal Government supports public health research through grants administered by the Public Health Service.

"Public health workers, accustomed to categorical grants and unfamiliar with the exacting methods prescribed by law for the review of research grant requests, have been slow to seek supplementary support from this source," he said.

To substantiate this statement, he gave the following figures: In the years 1951-56, of 15,342 research grants totaling almost \$162 million only 66 (0.6 percent) amounting to about \$1½ million (0.8 percent) went to State and local health departments.

This lack of participation was the result, not of a low approval rate, but of a low request rate, Hardy maintained.

Research in the new fields of public health needs to be accepted on the same terms as epidemiological investigation of communicable diseases, he declared.

Hardy noted that the Association of State and Territorial Health Officers recommended in 1955 that health departments assign responsibility for research planning to a person or a committee.

Florida, he reported, has designated a State coordinator of research and plans establishment of divisions of research and program development in a number of local health departments. The first is in the Dade County Health Department.

Social Scientist Itemizes Felt Health Needs

Health needs recognized by the public were identified and described by Donald G. Hay, a social science analyst of the U. S. Department of Agriculture.

Public awareness of existing local

HEALTH CARE NEEDS

health services, he observed, is rooted in their involvement in such services.

From the results of several public opinion surveys, most of them conducted in rural areas by land grant colleges or the U. S. Department of Agriculture, Hay listed the following as needs recognized by the public (see table also):

- Additional health care personnel and facilities, particularly physicians.
- More effective organization of health care resources: better spatial distribution of services, willingness of physicians to make house or night calls, expansion of home nursing services, reduction in waiting time in the physician's office, and more effective communication between physician and patient.
- Improved environmental health.
- Greater emphasis on preventive health care.
- Further development of voluntary health insurance.

With regard to health insurance, the studies revealed a felt need for more consumer education on both "the financial protection available

and how such a financing mechanism serves to make the rapid advances of health care available to people," Hay said.

From similar studies, Hay reported the following observations concerning the public's knowledge of existing public health services:

- About three-fourths or more of the households know about their local health department.
 - From one-twentieth to one-third do not know of any services provided by their local health department.
 - The services most frequently reported as "important" are vaccination and immunization, chest X-rays, sanitation services, and maternal and child health services.
 - Usually more people indicate that they have used services available in local health departments than report having used the department.
- "Improved two-way communication between the public and the health agencies and continuing efforts to step up active participation by the people in planning and developing programs," were Hay's concluding recommendations.

Suggests Functional Study For Nurse Recruitment

Study of functions and services is one approach to the recruitment problem in the Philadelphia Department of Public Health's division of public health nursing, according to Madelyn N. Hall, director of the division.

Believing that application of all available scientific knowledge to the problem might produce solutions, Hall emphasized the need to do more than look for "as many seeds as one can find." The kind of seeds, the fertility and nourishment of the soil, and the planting methods will determine the recruitment yield, she said.

Characteristic functions of the public health nurse include health teaching, health counseling, epidemiological investigation, and interdisciplinary planning, as well as the practice of nursing techniques.

Time and activity studies, Hall reported, revealed that this academic definition of function was being applied only to a limited extent. As a result of the studies, a

Summary of health care needs recognized by the public¹

| Survey area and date | Number of households reporting | Percent of households expressing need for— | | | | | |
|--|--------------------------------|--|---------------|---------------------------|-------------------------------|-------------------------------|-------------|
| | | More physicians | More dentists | More hospitals or clinics | Improved environmental health | More preventive care services | Other needs |
| <i>Rural</i> | | | | | | | |
| Six nonmetropolitan counties, New York, 1949-51..... | 1,490 | 41 | 20 | 44 | 2 17 | 2 16 | 2 2 |
| Two Piedmont counties, North Carolina, 1956..... | 611 | 60 | 31 | (3) | 10 | 2 | 5 |
| Perry County, Ark., 1955..... | 1,352 | 93 | 86 | 25 | 16 | 2 | 3 |
| Rural county, Kentucky, 1948..... | 122 | 88 | (3) | 62 | 10 | 9 | 9 |
| Rural areas, Michigan, 1948..... | 319 | 59 | (3) | (3) | 6 | 2 | (3) |
| Rural areas, Washington, 1947..... | 595 | 55 | 13 | 54 | (3) | (3) | (3) |
| <i>Urban</i> | | | | | | | |
| Mecklenburg County, N. C., 1952..... | 500 | 53 | 36 | 77 | (3) | (3) | (3) |
| Lucas County, Ohio, 1951..... | 590 | 30 | (3) | (3) | (3) | 3 | (3) |
| Urban areas, Michigan, 1948..... | 296 | 52 | (3) | (3) | 6 | 2 | (3) 12 |

¹ Based on results of surveys by various groups.

² 1,478 households reporting.

³ Not ascertained.

number of questions had to be answered and a number of steps had to be taken.

The first question concerned service: What are the service responsibilities of the official agency and what are those of the voluntary agency?

Hall termed the traditional view of these responsibilities provincial. Responsibilities have been defined on the basis of the source of income rather than on the basis of the indivisibility of public health practice, she maintained. Responsibilities have been agreed upon to prevent duplication of service rather than to provide an integrated service.

As an illustration of how it should be, she cited Philadelphia's approach to the impending onslaught of Asian influenza. Representatives of six voluntary and official agencies and two professional organizations developed a plan of coverage for the city, she said. All nursing resources are pooled, and supervision is provided by qualified personnel of any one of the participating agencies.

Integration of services, however, is not the complete answer, she observed, listing the following additional questions: What services should be provided? How complete a population coverage can one expect? How do we deal with the major types of changes which are going on in the modern world?

Barriers to answering these questions include mandates from public officials who control the purse strings, vocal community pressures and lack of agreement by medical personnel immersed in their own specialties.

Hall considers the factor of services crucial. How can one know what staff to look for if one is not certain of the kinds and extent of services? she asked.

However, with only partial knowledge of these matters, perhaps the problem can be tackled from the standpoint of characteristic functions, she suggested. She mentioned improvements in training of public health nurses realized through this approach.

Disability Pension Called Obstacle to Rehabilitation

The pension, when its continuation is dependent on proof of disability, is a primary obstacle to rehabilitation, asserted Dr. Dean W. Roberts, executive director, National Society for Crippled Children and Adults:

The worker who incurs a severe disability has had an experience that may shake his confidence in himself and in the world in which he lives, Roberts explained. He faces the alternative of fighting a difficult and at times discouraging battle to overcome his disability and regain independence or of withdrawing into the protection of dependency with its shattering effect on human personality and dignity.

"Some argue," he continued, "that the disability pension provides a secure economic base from which the disabled person can work toward rehabilitation. Others, however, and many experts in rehabilitation among them, hold that as long as a man's bread-and-butter income hinges on his maintaining proof that he is totally disabled, only the rare individual will . . . turn his back on the small but secure pension and fight for economic independence in a competitive society."

Considering the current status of rehabilitation efforts, Roberts observed that rehabilitation techniques are being applied relatively effectively to children and to adults with a vocational objective, but not to the severely disabled who have no vocational objective. The aged disabled in particular are being neglected, he said.

Roberts considers this situation a direct reflection of State and Federal laws, which in turn reflect the attitudes of the public.

The severely handicapped who are beyond the reach of substantial rehabilitation could achieve a large degree of self-care if the proper services were available, he argued. Such a program would be justified not only from a humanitarian standpoint but also because it would reduce the large burden of custodial care and would free professional personnel now tied down with such care.

The time has come, he declared, when the philosophy and practice of rehabilitation must be applied by all physicians and in all hospitals and nursing homes rather than by a few specialists working in a few centers.

Additional areas for improving rehabilitation work are motivation of the patient and coordination of services, according to Roberts.

School Health . . .

How Health Teaching Gains Status and Support

Health teaching often lacks status and public support, although no other area of the school curriculum, except American history and citizenship, has received more legislative backing, asserted Dr. Bernice R. Moss.

Moss, public health adviser, Program Development Branch, Division

of General Health Services, Public Health Service, pointed out that laws in many States require the teaching of hygiene, sanitation, disease control, and the effects of alcohol and narcotics.

Within the school, however, health teaching is often a stepchild; it lacks the academic tradition of other subjects and is often confused with physical education, first aid, driver training, or family life

courses. Perhaps health education lost some of its academic status when the term replaced the older ones, hygiene and physiology, stated Moss.

She outlined how health teaching can gain status and public support to become a potent force, enriching the lives of children and improving the community.

Health education flourishes in schools where an administrator, convinced that it is essential to the curriculum, provides for academic credit, classrooms, teaching materials, and above all, a trained teacher.

Ultimately the worth of health teaching in both elementary and secondary schools rests with the trained teacher, Moss stated.

Ideally, the elementary teacher is a generalist who includes health education in her total teaching assignment, who is aware of children's health needs and interests, and who motivates behavior in accordance with acceptable biological and social patterns.

The secondary school teacher treats health education as an applied science. She draws from the physical, biological, and social sciences the concepts important to human survival, development, and adjustment. Not just anyone can teach health, Moss declared. Skill in instilling these concepts in adolescents demands training and insight.

Where administrative support is coupled with teaching competence, health education achieves status in the students' minds and through them, in the community. The youth whose behavior is improved, whose intellectual curiosity is aroused, pleases his parents. He is the best argument for health teaching, and he builds understanding and support for it.

Community Interest

Where schools do little health teaching, someone or some group may bring about a change. The parent-teacher association, the county medical society's school

health committee, the community health or welfare council, or some influential citizen can request information about health teaching from the school superintendent or principal. Interest in improving health teaching and the willingness of a community group to work with the schools can lead to constructive changes.

The public school curriculum is responsive to the will of the people, stated Moss. But care must be taken to emphasize the broad health needs of the child and the community. Piecemeal education can result from a group's pressure tactics or insistence that a particular topic be added to the curriculum.

People must understand that no magic formula will protect life and promote health, Moss asserted. The health concepts and behavior of a people grow from their culture, and children reflect their parents' attitudes and beliefs. With enlightened public support teaching can be changed. Status will accrue to health education as it proves itself in the lives of children and the improved health of the community.

Mental Health Programs In Schools Evaluated

Mental health programs in the elementary and secondary schools urgently need an appraisal of their results, clarification of the anxiety factor in growth and motivation, and closer cooperation between behavioral science specialists and teachers, according to Dr. John I. Nurnberger, chairman, department of psychiatry, and director, Institute of Psychiatric

Research, Indiana University Medical Center. He ascertained these needs by scrutinizing current practices in educational mental hygiene.

Appraisal Needed

Merely stating that the mentally healthy student is an educational goal is not enough. A skeptical appraisal of present practices to test their basic hypotheses is needed, Nurnberger stated. He questioned whether students participating in group discussions, counseling experiences, and other mental health activities really become more stable, creative, productive, and conscientious persons.

After 15 years' emphasis on children's social, cultural, and emotional needs, is today's youth more anxiety-free and emotionally stable? Why has there been no substantial decrease in the incidence of juvenile and young adult social deviants? Nurnberger questioned.

He pointed out that the information for assaying the mental health of any segment of the school population has not yet been collected and that such information may amplify and correct present mental health criteria. School mental health projects as reviewed in 1951 by the Committee on Preventive Psychiatry of the Group for the Advancement of Psychiatry have, as a common goal, improvement of the child's emotional maturation to enable him to function effectively.

The teacher's attitude is vitally important in this process. She must be tolerant and permissive so that the student can readily accept and appreciate behavior and its determinants in himself and his peers. The teacher-pupil relationship should de-

Bold Approach

If we continue merely the routine activities of the past, the health officer will be merely a cog in an essential but undistinguished administrative machine; only with a bold approach to meet the new demands of the time shall we earn the sense of real achievement which comes to the pioneer.—C. E. A. WINSLOW.

velop a more tolerant superego, according to the committee report.

The more tolerant the superego becomes, it is asserted, the more insight into motivational factors is developed, and the greater the resultant relief from anxiety. Thus the student ego will be strengthened, it is reasoned, and the child should enjoy a greater degree of adaptability.

But Nurnberger questioned whether maximal freedom from anxiety is necessary and desirable for student maturation, and whether the student so prepared actually becomes stable, productive, or socially responsible.

If the answer to these questions is yes, it then follows, Nurnberger maintained, that emotional maturation and ambitious aspirations prosper without anxiety. He questioned the proposition that personal standards of behavior should be leveled to bring a student closer to his peers.

He also asked whether such leveling of standards was worth while if its aim was to alleviate anxiety.

American culture may have developed as aggressively and productively as it has partly because restrictive behavior standards forced people to sublimate their sexual, aggressive, and hostile urges, Nurnberger stated.

Observing a great difference between applying knowledge toward the better understanding of others and applying the same knowledge toward control or complacent acceptance of self, Nurnberger questioned school mental hygiene programs which casually substitute common custom for more exacting models of individual behavior.

Teacher's Function

Nurnberger discussed other issues, centering on the teacher, in school mental health. The ideal teacher is an emotionally mature, secure person who can provide understanding while still representing the real demands of social and personal behavior. The teacher in today's society finds it hard to maintain self-esteem and pride in her work, he pointed out.

The behavioral science specialists' responsibility is not only to work closely and consistently with student teachers but to support those engaged in prophylactic group instruction, Nurnberger urged.

Where recognized neurotic or deviant interactions between teacher and student may develop, the social scientists are yet woefully ineffectual, he declared.

Only by cooperative effort can the highly complicated discriminations that determine success or failure in school mental health programs be delineated. Critical followup appraisal of student adjustments to life may develop a better understanding of what mental health really is and how to attain it, Nurnberger predicted.

Psychiatric Services Placed in Schools

Social work in schools thrives best when the psychiatric clinic is within the school, observed Dr. Oscar B. Markey, chief of psychiatry, Mount Sinai Hospital, and consulting psychiatrist in the public schools, Cleveland, Ohio.

This conclusion derives from the basic importance of the group approach to correction of maladjustment, and from the fact that the school offers the most important proving ground for the growth of personality after the pattern has been established in the child's home. Markey also felt that with a clinic in the school it is easier to stimulate a psychiatric attitude among teachers through workshops, case demonstrations, and treatment.

The responsibility of schools for the emotional and social education of the child is inescapable, he said, since emotional history is frequently associated with academic progress or failure, whether as a consequence of normal growth or morbid reactions. The academic experience itself is productive of certain emotional conflicts.

Markey suggested that professional school facilities should intensify their psychological, medical, audiovisual, and guidance services. He also suggested that if the psychiatric clinic cannot be located within the school, psychiatry and its allied disciplines should serve schools through community facilities or by means of psychiatric consultation.

Whatever efforts are undertaken, Markey concluded, the principal of the school remains the key figure, and the teacher is of first importance in the direct application of these efforts.

Voluntary Organizations Aid School Health

"Today's broadly conceived school health program cannot be isolated within the walls of the school and apart from the child's family and community life," asserted Dr. Ralph H. Boatman, director of health education, Tuberculosis Institute of Chicago and Cook County, Ill.

These walls are more easily breached, Boatman said, if the resources of voluntary organizations which are willing to provide staff time and funds to increase child health are properly utilized.

Boatman singled out the contributions of the National Congress of Parents and Teachers, and their local PTA units, to child health. They have sought, in cooperation with other voluntary organizations and government agencies, to make child health a family matter. They have recommended that school health activities be a continuation of earlier, familial experiences. If their suggestions are accepted, Boatman said, family physicians, parents, and teachers will plan sound health measures for the home, school, and community as a unit.

Efforts of the PTA in the past, Boatman pointed out, have resulted in improved community health through fluoridation of water, safety measures, and tuberculosis surveys.

Despite the PTA's willingness to co-operate on matters concerning child health, many school administrators and teachers have failed to appreciate the value of this resource, Boatman said.

Boatman described several instances where voluntary organizations, in cooperation with school and college officials, have provided information, professional knowledge, and skills to promote health. He also pointed out that these organizations have helped recruit health workers and have served as field training or observation centers for college and university students who are working on community health problems.

Voluntary organizations, he went on to say, have aided school health through research and the demonstration of new ideas. The nurse's affiliation with public schools had its beginnings in a voluntary organization's demonstration project, he said.

Voluntary organizations have also contributed to school health, Boatman added, by supporting desirable legislation, and by interpreting school programs, problems, and needs to the community.

How Schools Can Help The Disturbed Child

The school can help emotionally disturbed children in many ways, stated Dr. Harriett B. Randall, assistant medical director, Los Angeles City Board of Education. As essentials of school-provided help, she listed a healthful environment, intelligent intramural and extramural guidance, and stable teachers.

A punishing, rejecting teacher cannot help a distressed pupil or may not even be aware of his emotional distress, Randall asserted. The teacher must be able to detect the emotionally disturbed among children who are noisy and aggressive, or isolated and too conforming, or defiant and destructive. She must also recognize normal personality variations.

A teacher uncertain about a child's adjustment should have help from the school principal, parent, counselor, school nurse, doctor, and others skilled in child understanding, Randall stated.

Remedies

Once the disturbed child is recognized, a parent interview, a good physical examination, and psychometric tests are the first steps. These may indicate a remedy ranging from providing for a hot breakfast or lunch, a rest period, or new clothes, to obtaining glasses, a hearing aid, or treatment for anemia, petit mal, or parasites.

Randall cited the case conference, where all those working with a child pool their information and plan how the school can help him, as a productive technique.

The conference covers the child's school and health records; reports from the school nurse or doctor of examination findings, home visits, hospital and clinical findings, parent conferences, and classroom visits; from the counselor's psychological case study and psychometric tests; from the child welfare and attendance supervisor of home calls; from the teacher of observations and test results; and reports from the guidance clinic and school principal.

Arrangements to help the child adjust, Randall suggested, may be a short school day, remedial classes, a social adjustment transfer to give him a new start with new people, an appropriate transfer of a limited child to a school for the mentally retarded or for those with severe physical defects, or a short exclusion from school. However, all children cannot be helped in school; other pupils cannot be deprived because of extraordinary effort to aid the unadjusted child.

Study of Referrals

Randall discussed other procedures the Los Angeles school system uses. A difficult or urgent decision about a pupil is often referred by the local school to the health branch's central administrative office. Parents and teachers accept a central office deci-

sion more readily, and often the examiner is better prepared to aid the pupil.

A study reported by Randall of a random sample of 50 such special referrals during the past 5 years to the central office show that 30 of the students were boys and 20 were girls, and that their age spread was from 5 to 16 years. Fewest referrals were of 5-, 6-, and 8-year-olds (2 each), and the greatest were of 13-year-olds (8 referrals compared with 3 for 12-year-olds and 4 for 14-year-olds).

Only 19 children had parents currently living together; 17 lived with mothers; 2 with fathers; 1 with mother and stepfather; 1 in a foster home; 1 with mother, father unknown; and 1 with mother, father in a mental hospital. No data were available on the parents of eight children.

Thirty-three had marked or severe emotional instability; eight showed severe behavior disorders; and the others were psychotic or showed marked anxiety, apathy, or school phobia.

The study revealed that the most referrals were for aggressive behavior (20 boys, 8 girls); 8 (6 girls, 2 boys) were for withdrawal characteristics; and 14 for other types of behavior.

Exclusion from school for varying lengths of time was recommended for 36 of the children; 14 returned to school part time or on trial, but only 1 of them adjusted satisfactorily in the referring school.

Guidance Clinic

Randall described the school guidance clinic as another means of helping children. Los Angeles schools and the parent-teacher association jointly maintain a school guidance center and three branch clinics, headed by a chief psychiatrist and staffed with child psychiatrists, psychiatric social workers, and clinical psychologists.

The clinics treat children with school adjustment difficulties and offer diagnostic services and brief therapy. They work closely with the re-

ferral school as well as with the educational staff through inservice training. The guidance clinics are valuable in helping children to adjust, Randall stated.

Throughout the school system are people who help children with emotional problems. To assist a child, all staff members have a responsibility to work as a team, without duplication and lost effort. Prompt, efficient work will detect abnormal behavior early. Frequently aid is available within the school system, Randall declared.

Research Needed To End School Predicament

Research to determine what is presently being accomplished is school health's foremost need, declared Dr. Leona Baumgartner, commissioner of health, New York City Department of Health.

After recalling the history of APHA's school health section, she turned to future prospects in this field of service.

School health faces a peculiar predicament, according to Baumgartner. By 1975, the 5- to 17-year-olds will number 57 million, almost double the 1950 figure, if levels of fertility remain constant. Present shortages of all kinds of health personnel will be enormously magnified in the future. And there is now no real information as to what school health services actually accomplish.

These factors will make it ever more difficult to attract funds and workers, Baumgartner pointed out. Cost figures are difficult to determine, but more than \$58 million has been spent by schools in 40 States. School health personnel should be able to advise how to spend this sum, she said.

Research Needed

Baumgartner proposed greatly expanded research which can stand up to rigid scientific standards. This would include basic research on children's growth and development;

clinical research on the prevention of disease and disability and on early diagnosis and treatment for those afflicted; and broad scale, operational research of existing school health services.

She posed these questions: Are current methods in health education producing generations who live more healthfully than those in the past? What makes young people and their parents seek health?

What is the classroom's social and emotional climate? Can it be measured? Has it been examined closely enough?

Are medical and paramedical people finding and correcting a larger proportion of defects than 10 years ago? If so, have school health or other community health forces done this, and how has it been accomplished? Are there figures to compare one community's results with another's?

What type of studies of school activities has been most productive? What criteria have been developed to

test the effectiveness of school health programs? Are research workers being trained to do this job?

Cites Critique

Baumgartner cited a critique of school health services which analyzes past studies and suggests future investigations (*School Health Services: A Selective Review of Evaluative Studies*, by Bronson Price, Children's Bureau Document No. 362, January 1958).

She urged academic leaders, practitioners, and those who finance school health to give research top priority in the next decade.

School health personnel need to know if effort and scarce professional talent are being wasted. They can then abandon unfruitful procedures for practices which demonstrably improve the physical, social, and emotional health of school children.

"We dare not go on as we are now—asking for more and more of the same kind of service," Baumgartner declared.

Food and Diet . . .

Immune Milk May Give Protection to Humans

Human beings can acquire considerable passive immunity to disease by drinking milk from cows whose mammary glands have been stimulated to secrete specific antibodies.

Dr. Berry Campbell, associate professor of anatomy, and Dr. William E. Petersen, professor of dairy science, University of Minnesota, have demonstrated that adult humans can absorb a low percentage of antibodies from milk of very high titer.

Earlier experimenters failed to show that antibodies could be absorbed from milk because they had used milk of low titer and expected a high percentage of absorption, Campbell and Petersen said.

The remarkable ability of the cow's udder to produce antibodies was utilized to obtain immune milk. Vaccine injected directly into the teat canal, rather than intramuscularly or subcutaneously, resulted in milk with the highest antibody content.

Milk, like blood serum, contains a globulin fraction rich in specific antibodies. The mammary gland, with its large amount of lymphoid tissue, secretes milk's immune globulins. The spectrum of immunity in the milk corresponds to the cow's immunological history and serves as the early immunizing agent for the calf.

Immune milk is not a new subject, Campbell and Petersen pointed out. Sixty years ago Paul Ehrlich analyzed the transmission of protective antibodies through milk; his associate, Emil von Behring, believed that

immune milk could control human tuberculosis.

In the last 20 years it has been shown that milk antibodies are similar, if not identical, to serum antibodies. The authors demonstrated in 1950 that antibodies of colostrum and milk were manufactured in the mammary gland. This finding led them to try direct immunization of the gland to produce milk high enough in titer to be absorbed by human beings.

Absorption

Absorption of antibodies from immune milk was observed in both animals and human beings. Mice, tested for the milk globulin's protection against *Salmonella pullorum* infection, showed approximately 10 percent efficiency of absorption. Five milligrams by mouth equaled the protection of 500 micrograms given subcutaneously.

For this test, globulins were isolated from the milk of cows specifically immunized with this organism. Protective properties were quantitated by administration to experimentally infected mice. The prolonged life of the experimental animals over that of the controls indicated effective passive immunity. Fifty micrograms of immune globulins per mouse provided protection in massive experimental infection, and 5-microgram doses gave perceptible protection.

In human beings the authors also observed an uptake of immunity. For example, a man drank a liter of milk per day from a cow immunized with polyvalent streptococcus type A vaccine. The milk's titer was 1:1,000 dilution in a plate agglutination test. In 5 days the man's serum, previously negative, showed agglutinating antibodies, which increased to a plateau of 1:56 by the 19th day.

In other trials made with pollen antigens during the winter months, the skin tests of highly sensitive people changed from positive to negative after they drank milk containing blocking antibodies to ragweed pollinosis.

Some were kept free of all symp-

toms during the entire pollen season. In another experiment, 36 people received statistically significant protection over their controls by drinking a pint of immunized, powdered milk per day.

Implications

Pending large-scale field trials of immune milk, the authors have anticipated some of the implications.

A useful immune milk should be polyvalent, and in recent experiments they found that multiple immunization of cows was possible. One antigen did not interfere with another in milk from cows immunized with 21 strains of human enteric pathogens of *Salmonella*, *Shigella*, and *Escherichia*. Studies using a single packet of 11 antigens of bovine diseases had similar results. High titers to each species were obtained.

Injecting udders with antigens did not lower milk production in regular, high-grade commercial herds already immunized. Immunizing cows would, however, increase production costs. The manipulation involved requires a skill equal to the technique of artificial insemination, according to the authors.

They found that the temperatures necessary for pasteurization and for preparing powdered milk interfered little with antibody activity despite the heat lability of milk globulins. The heat needed to process canned milk, however, caused problems. Milk specifically immunized does not differ in taste, consistency, or chemical composition from ordinary milk.

Immune milk may lead to reevaluating the protein fraction of this food, they said. Breeding of cows and marketing and grading of milk have long concentrated on butterfat content and disregarded other constituents. The protein fraction will acquire a new importance if milk is used for protection against disease.

The potential of scientifically immunized milk has many implications for public health, Campbell and Petersen explained. Nutrition gains a new dimension beyond its present goal of maintaining energy balance

and health. And understanding how mammals protect their young from disease through milkborne antibodies may yield new techniques to battle illness.

Food Additives Pose Continuing Problems

Chemicals and antibiotics in food today confront those administering food and drug laws with many problems. Robert S. Roe, director of the Bureau of Biological and Physical Sciences, Food and Drug Administration, pointed out some current problems and showed how present legislation deals with them.

In the last 15 years science and technology have created new organic compounds, new drugs, new manufacturing processes, and new packaging. And the stabilizers, preservatives, antioxidants, tenderizers, emulsifiers, sweeteners, colors, flavorings, growth promoters, and residues of fungicides, insecticides, defoliants, and herbicides that find their way into the food supply seem limitless, Roe declared.

The Pesticide Amendment to the Food, Drug, and Cosmetic Act, passed 3 years ago, regulates one type of food additive. It provides for establishing safe tolerances for residues of pesticides in raw agricultural products. Administering the law has revealed many difficulties. But the statute is workable and has resulted in several hundred tolerances on various products, stated Roe.

Colors and Poisons

Coal-tar color additives are governed by special provisions of the law. The statute authorizes the listing of coal-tar colors that are harmless and suitable for use in food and for certification of batches of such colors. Under this provision 18 colors were listed as harmless and suitable for use.

However, the application of newer techniques in pharmacology and more complete information on

the chemistry of these dyes have caused 3 colors to be delisted in 1956, and delisting procedures for 4 others are under way. An amendment to the law, recently introduced in Congress, would relax the present harmlessness rule and replace it with authorization to establish safe tolerances for coal-tar colors.

The Food, Drug, and Cosmetic Act also prohibits adding any poisonous or deleterious substance to food unless the addition is required in production or cannot be avoided in good manufacturing practice. If the addition is necessary or unavoidable, then safe tolerances may be established.

But this provision fails on two counts to solve the problems of chemical additives, Roe said. First, the poisonous or deleterious properties of many substances may not be known, and to prevent their use, the Government must be able to show affirmatively that the additive in question is poisonous.

Second, some additives, while not necessary, may be desirable to improve nutritive values, preserve color or flavor, or serve purposes useful to the consumer. The law, however, permits no additive unless it is necessary.

Misuse of antibiotics in treating animals may also affect food derived from these animals. For example, penicillin used to treat cows for mastitis has appeared in their milk. Even small amounts of penicillin may cause serious reactions in persons sensitive to the drug. Changes in the antibiotic regulations, relative to certification of mastitis preparations, have been instituted to correct this.

Antibiotics, when used as food preservatives, are in the category of pesticides. While tolerances have been established for residues of some antibiotics used to treat raw poultry, we think that generally antibiotics have no place in food as consumed, said Roe.

Antibiotics, estrogenic hormones, arsenicals, and other chemicals that affect growth or fattening when added to stock or poultry feed may

find their way into food. When used as growth-producing or fattening agents they are classified as drugs.

Under the law a new drug cannot be distributed unless it is the subject of an effective new-drug application, submitted by the promoter along with adequate evidence of the substance's safety. The Food and Drug Administration has held that evidence of safety in drugs intended for animal use must include proof that there are no residues in food derived from the treated animals, Roe stated.

Unsolved Problems

The problems posed by chemical additives are of great public health significance. They are particularly complex because the question of safety usually does not involve acute toxicity, but the more subtle and difficult-to-appraise chronic toxicity.

Consideration of the use of additives Roe said, involves such difficult questions as: What is the effect of regularly consuming a quantity of a chemical over periods of years? Will relatively innocuous additives adversely affect a food's nutritive values? What are the possibilities that mixtures of additives at safe levels will have a potentiating effect on toxicity? How can the chronic effect of ingesting additive residues be detected and measured in human beings?

Method Will Measure Attitudes Toward Food

Increasing a patient's self-esteem and minimizing authoritarian control over him can reduce malnutrition associated with emotional disturbance, said Dr. Franklin C. Shontz, psychologist, Highland View Hospital, Cleveland, Ohio.

When eating problems are the cause, or a contributing cause, of physical malfunction, treatment is especially difficult, from a psychological point of view. But when unhealthy eating behavior is a superimposition upon a disease unrelated

to dietary insufficiencies, treatment is possible, he said.

In this latter case, problems in eating stem from an intense emotional reaction to being ill and hospitalized. Fear, hostility, and a sense of self-disintegration are not unlikely reactions. In addition, Shontz observed, a patient may have a life-long history of borderline nutritional adjustment.

The hospital setting, Shontz said, is particularly trying. For the hospitalized patient, there is not only the necessary physical loss to face, but there may be an even greater loss: the loss of privacy; the loss of self—the possible identification as being first and foremost a disease. The whole situation is only made more difficult by the fact that one no longer has his choice of what he is to eat; one no longer picks his dining partners; one no longer decides when and where he will eat.

Under these conditions, the patient may adjust poorly to any dietary schedule. But up to now, Shontz said, there have been no means of measuring, no controlled research on, the adequacy or inadequacy of any specific regimen.

To offset this situation, Shontz offered a method by which environmental influences on eating habits could be determined.

First, he said, one must formulate a criterion of nutritional adjustment. This criterion should be able to measure (a) the adequacy of the patient's diet, (b) his attitudes toward food, (c) the manner in which food is served, and (d) the total hospital situation. The criterion would provide, Shontz said, "an index of nutritional adjustment as well as a yardstick by which changes in food acceptance may be evaluated."

Second, patients should be allowed at least limited choice in what, when, and with whom they eat. At meal times, he cautioned, "they should be fed promptly and regularly, and by people they genuinely like."

Third, after the patient has been permitted a limited choice in these matters, the choices should be curtailed for a while one by one, and

then reinstated. Each change that is really important to the patient would be reflected in the measurements established by the criterion of nutritional adjustment.

Experimentation along these lines, Shontz said, will result in better patient care and will increase our knowledge of the psychological factors in eating.

Dieting Is Inadequate For Obese People

Reducing is not a cure for obesity, paradoxically asserted Dr. Hilde Bruch, associate clinical professor of psychiatry, Columbia University. And she warned against efforts that treat only obesity and not the person.

Reducing should follow upon improvement in the obese person's total adjustment. "The ability to reduce," she said, "is only a confirmation that such improvement has taken place."

We too often look upon overweight as a deviation from a norm, she said. Decriing this attitude, she observed that individual differences are far more important in obese people than statistical similarities.

Bruch pointed out that there are many different types of obesity. Weight excess in some adolescents, for example, may simply be a function of rapid growth and development, or it may be "normal" according to their constitutional makeup. For others, overweight may be caused by physiological pathology or emotional maladjustment.

When obesity is a function of psychological maladjustment, it should be considered as symptomatic of some underlying disturbance and treated accordingly. But treatment, she said, should not be instituted on the basis of weight alone.

Condemning social derogation of obesity, Bruch called for a reeducation of the public which has humiliated, rejected, and isolated the fat person. Untoward criticism of the obese person, solely because of his excess weight, may precipitate emotional disturbances which in turn

may lead to greater obesity and perhaps to severe mental illness.

Synthetic Food Enrichment Need of Hungry Lands

If the world's population ever seriously taxes total food supply, the only way to make the cheapest foods protective is by chemical synthesis, according to Dr. Robert R. Williams of the Williams-Waterman Fund for the Combat of Dietary Diseases, Research Corporation, New York City. "It requires about seven times as much land to produce a million calories of meat or milk as it does to produce a million calories of cereals," he said.

Williams first forecast the world pattern of adoption of current types of food enrichment. The practice of enriching fats with vitamin A, if extended to cooking fats by the use of suitable antioxidants, he prophesied, would take the lead over all other types, since fats are used in some form by all peoples. There is a deficiency of this vitamin in the staple foods of the masses in developing countries, and the vitamin is cheap. Changing dietary patterns is slow, he said, and impossible if the shift in crops is uneconomic.

The practice of enriching cereals, which supply 80 to 90 percent of the calories for the majority of the world's population, is the most widespread at present, largely to offset the tendency to mill wheat, rice, and sometimes barley to whiteness. Williams concedes that such milling may someday be outlawed or abandoned, especially if the difficulty of conserving undermilled products is surmounted. However, present trends are not in that direction.

Voluntary rice enrichment in the Philippines, as in other developing countries, is inhibited by the competitive disadvantage of the added expense, but Williams feels the mandatory enforcement of that practice in the Philippines, with a conspicuous fall in the death rate, will pave the way for its success in most of rice-eating Southeast Asia.

Vitamin D fortification of milk Williams expects to be confined to areas of colder climate, and the addition of iodine to salt, to goiterous areas.

The Economic Hurdle

As for chemical synthesis of the total food supply, Williams pointed out that the major food components—carbohydrates, fats, and proteins—are produced vastly cheaper by the farmer than by the industrial producer. Under noncompetitive conditions, glucose as food has been made from woodpulp, and fats from petroleum. He also mentioned experiments combining sugarcane, an abundant crop, with blackstrap molasses and synthetic urea for the carbohydrate and protein needs of cattle.

Williams believes that for some generations to come the major supply of food will come from the farm. He questioned, however, whether all the advances in farming for another hundred years will meet the needs of a population growing at an accelerated rate.

The lack of good protein is the key challenge for ill-nourished peoples, said Williams, as evidenced by kwashiorkor among children where animal protein is low. Since animal proteins are superior to cereal proteins in three amino acids, logically by supplementing cereals with these acids in proper proportions, the deficiency would be repaired. But to produce required amounts would be uneconomic at present.

Williams' solution lies in reducing costs through large volume production. Pointing to the fall in prices of thiamine and riboflavin from \$1 a gram to 4 cents, he urged that producers be encouraged to make and market synthetic organic chemicals.

Atherosclerosis Research Seen Changing Diet

Stressing the uncertainty of the role of diet in atherosclerosis, Dr. Juanita A. Eagles, assistant research professor at the University of Pittsburgh Graduate School of Public

Health, cautioned health educators against generalizations on the subject.

At the same time, she does see the possibility of sweeping changes in the adult diet, once data from current research become definitive. Certain findings relate the diet's total calories, fat, and animal protein content with atherosclerosis and hypercholesterolemia, she said, pointing out that the "well-fed American is now said to be consuming a diet of 12 percent protein, 50 percent fat, and 38 percent carbohydrates."

Presently, the nutritionist interprets the physician's dietary directions to the patient, attempts to overcome emotional and cultural objections to the change, and studies the effect of stressful events on adherence to the diet. But as a result of research, she said, nutritionists may have the task of changing diet habits of the hypothetical "coronary-prone" United States population estimated at 50 million.

As for atherosclerosis, Eagles advised teaching dietary habits to the young in order to influence the largest number of persons and to emphasize preventive values in health practices. Besides, she added, it is easier to develop food habits in young people than to change fixed habits in the mature.

Food Enrichment Spurred In Near and Far East

A review of nutritional studies seeking ways to enrich food in several countries of the Near and Far East was presented by Dr. Arnold E. Schaefer, executive director of the Interdepartmental Committee on Nutrition for National Defense, National Institutes of Health, Public Health Service.

On official requests from Iran, Pakistan, the Philippines, Turkey, Korea, and Libya, the surveys were launched by the interdepartmental committee in January 1956, and, as part of the Mutual Defense Assist-

ance Program, were directed primarily toward the armed forces of the host country. In addition to defining nutritional needs through biochemical and physical tests and food studies, the program aimed at training personnel in evaluation techniques and providing basic equipment for nutrition laboratories.

Schaefer reported that in general the major nutrition deficiencies were of riboflavin, thiamine, and vitamins C and A. In recommending food enrichment methods, he said, the committee kept in mind possible variations in nutrition needs within each country, as well as the value of keeping in harmony with local diet patterns and nutrition concepts.

In Korea, the committee recommended that enrichment of white flour supplied by the United States be raised to 3 mg. from 1.2 mg. of supplemental riboflavin per pound.

As a result of the survey findings, the Pakistanis are now conducting a study on effects of iodine intake on goiter in adolescents, and on related production and distribution questions.

In Turkey, Schaefer said, flour enrichment with riboflavin was being considered. The committee recommended increased fortification of margarine with vitamin A as well as control measures to insure the new level. Also suggested was a more even distribution of leafy vegetables, citrus fruits, and of the native "rose cake," a rich source of vitamin C.

In the Philippines, the committee recommended that the rice enrichment successful in Bataan against beriberi be extended throughout the islands, said Schaefer.

For the Republic of China in Taiwan, the committee advised that a rice enrichment pre-mix plant be set up and that pre-mix feeding machines be installed in mills supplying the Army. Surplus plant capacity would produce enriched rice for schools and other official institutions, he said. To avoid delay in raising enrichment levels, the alternative use of an enrichment wafer

was recommended and initiated, with the advantages of standardized recipe and equipment, rapid operation, low cost, and uniform rice color.

Among sidelights of the surveys, Schaefer recalled that in Libya, despite inadequate intake of calories, riboflavin, thiamine, and vitamins C and A, classical signs of nutritional deficiency appeared in few men examined. Such findings, he said, underline the need for study of body adaptation to suboptimal intake of multiple nutrients.

He remarked also on the value of *kimchi*, a preserved mixture of radishes and Chinese cabbage noted in the surveys, which is an excellent source of vitamins C and A for winter. Food fortification may well use fermented products someday, he said, citing also the enrichment of *miso*, a fermented soybean product of Japan, and Japanese experiments on a high riboflavin producing yeast for fermenting *miso*.

Psychiatrist Prescribes Look Into Diet Changes

Any public health dietary prescription must take into account symbolic and emotional meanings of food and eating, according to Dr. Walter W. Hamburger, associate professor of psychiatry, University of Rochester School of Medicine and Dentistry.

Food preferences as well as eating habits are emotionally invested with these personal meanings. Each individual's life experience determines them. The child's emotional relationship to his mother and other early childhood experiences in the family are potent factors in setting eating patterns, Hamburger maintained. The cultural pattern in which people live plays a large part in establishing non-nutritional meanings to food and eating.

Some people are aware of the reasons for their food likes and dislikes; others are not. Some of these associations and symbolic meanings have been learned from clinical psy-

chiatric and psychoanalytic experience, Hamburger said. Some general principles have been derived, but research is needed in many specific areas, such as decreased or altered fat intake.

The motivation for dietary changes and possible emotional complications arising from attempts to make major changes in the diet will contribute to the efficiency of any dietary public health program. There is evidence that emotionally stable individuals can more easily modify their diets than can those who are not stable. This observation has been made in response to the question of reducing diets for the obese.

Similarly, the incidence of emotional complications ensuing from major dietary changes would be greater in the emotionally unstable. This is because certain individuals utilize specific eating patterns and even specific foods to satisfy their emotional as well as their nutritional needs. For such individuals, attempted alterations of eating patterns for nutritional or public health program reasons may lead to emotional complications. Hamburger feels this is less likely when food substitution is recommended (unsaturated for saturated fats) than when total food restriction is advised (low-calory reducing diets).

temperature was above the median for those months, first admission rates increased. Admission rates were 1.658 per 1,000 for July and 1.519 per 1,000 for August, compared with 1.276 and 1.206, respectively, in those years when the mean temperature was below the median. Total admission rate, when the weather was hot in June, July, and August, was 1.524, compared with 1.295 when the weather was cool ($\chi^2=10.02$; $P<.001$). On the basis of mean temperature, July's difference is three times as great as the difference between the first and third quarters of all the years under investigation.

The accompanying table compares first and third quarters, and months within those quarters, for significant variations.

The significance of their findings for public health workers, they believe, lies in the fact that environmental rather than inherited factors may play a larger role in the formation of the individual than heretofore believed. Public health workers, the report recommends, by paying greater heed to dietary control, particularly in hot months, can take measures to prevent mental deficiency.

Mental Health . . .

Climate and Diet Cause Mental Deficiency

Inadequate diet in early pregnancy during hot summer months may have an adverse effect on child development, according to Dr. Hilda Knobloch, director of the child development clinic and associate professor of pediatrics, and Dr. Benjamin Pasamanick, director of psychiatric research and professor of psychiatry, both of the Ohio State University College of Medicine, Columbus.

Since damage to the cerebral cortex during its formation in the third month after conception could affect intellectual functioning, the authors originally sought to test the postulate that the prevalence of viral infections during winter months would result in a greater incidence of mental deficiency among infants conceived in those months than at any other time.

Their findings, however, introduced another hypothesis, because the first trimester of mentally deficient children occurred more frequently during the summer than

winter. The cause of mental deficiency, therefore, Knobloch and Pasamanick suggested, may be related to the tendency of expectant mothers to reduce their food intake, especially proteins, to dangerously low levels during hot weather.

This conclusion emerged from the study of the records of 5,855 admissions of mentally defective children to the Columbus State School between 1913 and 1948.

In these records they found, for example, that when the eighth to twelfth week of pregnancy occurred in July or August, and the mean

Problems in Measuring Patient Changes Outlined

The number of patients resident in public mental hospitals (exclusive of the Veterans Administration) in

Admission rates for mental deficiency, by season of birth, Columbus State School, 1913-48¹

| Season | Number of births ² | Number of admissions | Rate per 1,000 |
|---|-------------------------------|----------------------|----------------|
| February ³ ----- | 339,704 | 512 | 1.507 |
| August ³ ----- | 377,085 | 489 | 1.297 |
| January, February, March ⁴ ----- | 1,061,183 | 1,535 | 1.442 |
| July, August, September ⁴ ----- | 1,112,933 | 1,467 | 1.318 |

¹ Excluding 1946. ² Number of births in each month supplied by the Ohio State Health Department. ³ C.R.=2.3; $P<.02$. ⁴ C.R.=2.4; $P<.02$.

the United States decreased in fiscal year 1955-56 from 559,420 to 552,005, the second decrease ever noted in these hospitals.

Moreover, the observed number of resident patients was 21,855 less than the 573,890 patients expected on the basis of the 1945-55 trend. This deviation from trend was by far the greatest that occurred in the period under study.

These are some of the facts uncovered by Dr. Morton Kramer and Earl S. Pollack of the Biometrics Branch of the National Institute of Mental Health, Public Health Service.

Since the decrease occurred at a time when tranquilizers were being used extensively, Kramer and Pollack discussed the problems involved in assessing the effect of tranquilizers as well as other therapeutic procedures on patient movement in hospitals. Their analysis emphasized the inadequacy of crude movement data in making these assessments, and they suggested a data collection method that would yield more sensitive indexes.

Expected and Observed Values

In comparing observed values in 1956 with those expected on the basis of the 1945-55 trend in the public mental hospital systems of the 48 States, Kramer and Pollack found:

- Admissions were higher than expected in 24 and lower in 24.
- Net releases were higher than expected in 33 and lower in 15.
- Deaths were higher than expected in 42 and lower in 6.

Population Changes

Gross changes in a mental hospital resident population, Kramer and Pollack pointed out, are a result of additions to and removals from a baseline population. They show, in the accompanying chart, how this addition and subtraction takes place.

The chart portrays a hypothetical hospital with a resident population of 1,000 at the beginning of a year. During the following 12 months, 303 persons are added (243 admissions

and 60 returns from extramural care), and 276 are removed (187 releases and 89 deaths). Since additions exceed removals by 27, the resident population at the beginning of the next year is 1,027.

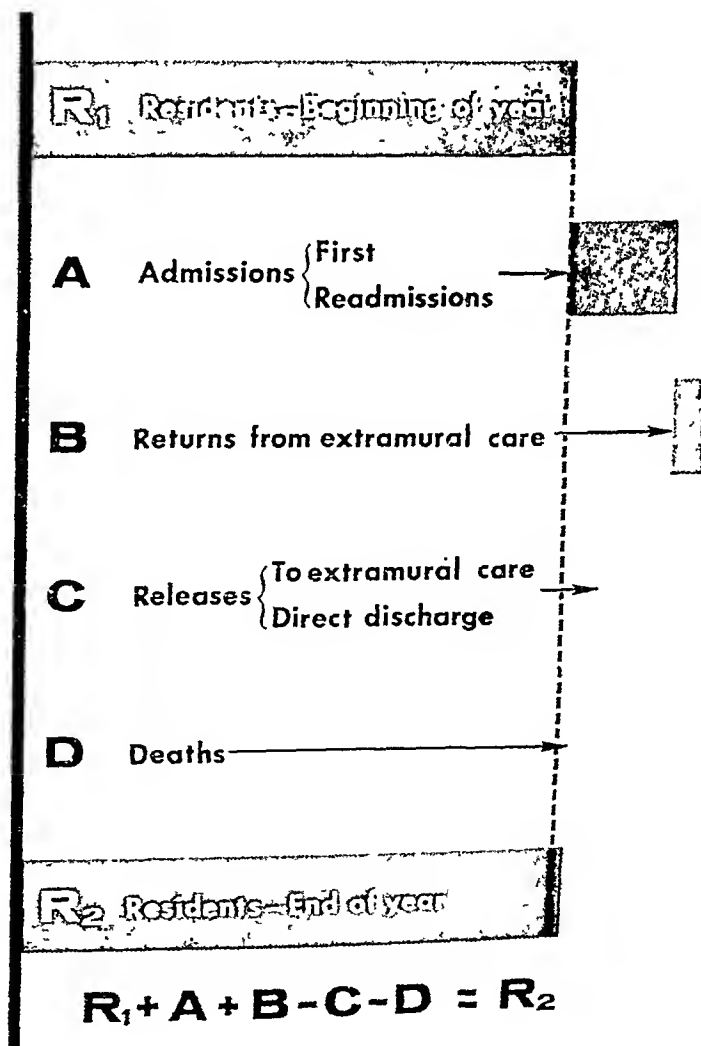
National data are available, the authors added, on all movement items except B and C in the chart. It is possible, they pointed out, to determine C-B, which is the net number of patients released to the community in any one year.

The authors emphasized that changes in size of resident population between two points in time is a

function of three variables—admissions, net releases, and deaths. They stated, "If we are to understand the factors that account for the rise and fall of mental hospital populations, we must undertake studies that relate variations in admissions, net releases, and deaths not only to hospital factors but also to extra-hospital factors which can affect these variables."

To provide some of the information needed for proper analysis, Kramer and Pollack suggested the compilation of (a) resident patient cards at the start of each year containing

Gross changes in a mental hospital resident population.



basic data on each patient, such as age, sex, diagnosis, duration of hospital stay, and any other desirable data, and (b) patient movement cards recording significant movements in or out of hospitals during a year. These cards should contain the same information on each patient as the resident patient cards.

The introduction of new treatment methods and new psychiatric facilities affects the use of facilities and treatment in the reduction of disabilities from mental disorders. Measuring these effects, the report concludes, is an epidemiological problem.

To quantify the impact on the mental hospital of tranquilizing drugs and such other therapies and programs as may be developed in the future requires revision of existing statistical systems. But equally important, the authors went on to say, is the development of programs which will coordinate data on utilization of all community treatment facilities so that the mental hospital's role can be studied in relation to that played by these other community facilities in the treatment and rehabilitation of the mentally ill.

Interview Experience Eases Relationships

Public health workers develop greater self-confidence as a result of 5-day interpersonal relations institutes, according to Hyman M. Forstner and Dr. Joseph J. Downing, New York State Department of Mental Hygiene, and Dorine J. Loso, Public Health Service, Denver, Colo.

The authors described and evaluated 4 institutes of 11 conducted by the departments of health and mental hygiene in New York State since 1950.

Description

The institutes were normally composed of 25 voluntary participants meeting in a relatively isolated community where beneficiaries of health services were available for interview-

ing. Several members from each of several health units were invited to participate because it was felt that the effect of the experience would be greater and more lasting than if only one attended.

Demonstration interviews were held in the mornings. In these, the participants observed a psychiatrist and his subject through one-way vision mirrors and listened through headphones to their conversation. The psychiatrist who conducted the interview informed his subject that public health people were listening; but not that they were looking.

The participants' attitudes toward these interviews were later analyzed, and it was found that they had at first identified themselves with the client, but gradually shifted identification to the psychiatrist. By the fourth day, the shift was complete. This experience brought into the open the reluctance of participants to ask people about their life situations, a reluctance indicative of a general resistance to self-appraisal.

This resistance, on the other hand, produced tensions upon which the success of the institute depended. The most successful institutes, the report states, were those where initial tensions were high and gradually came to their lowest point on the last day.

In the afternoon, participants conducted interviews, each on his own unless he wished to include others. A psychiatrist maintained control over the proceedings. Morning and afternoon interviews were followed by discussions.

Evaluation

The participants found the institutes valuable. The report states, "They tell us their approach to fellow workers and to clients is easier, more pleasant, and more rewarding."

Objective psychological tests, administered by the institute's staff when it was over, revealed that participants were less dogmatic and less rigid in their behavior. At the same time, there was a loss of interpersonal acuity and an increased ac-

quiescence to authority. These latter tendencies disappeared within 6 months, and a greater self-assertiveness, expressed through self-confident behavior, was found, the authors reported.

Psychiatrist's Time Used Economically

"The child psychiatrist in a public agency can make his greatest contribution to the mental health of his community by functioning as a diagnostic consultant . . . and by delegating appropriate therapeutic tasks to ancillary personnel."

This approach will increase the number of patients the psychiatrist will be able to see, according to Dr. Leou Eisenberg, assistant professor of psychiatry and pediatrics at the Johns Hopkins University and Hospital, Baltimore.

Eisenberg submitted results obtained from a special diagnostic clinic set up to help 48 foster children who were emotionally disturbed.

Treatment began with a diagnostic conference to determine type and severity of disturbance and suitable placement for the children. After these decisions, case workers from the welfare department were given the responsibility "to develop a sustaining relationship with the child, to interpret clinic findings to foster parents, schools, and court, and to secure group activities."

Among other therapeutic measures were the assignment of Big Brothers, speech correction, and the substitution of new peer activities for the company the children had been keeping.

After an average interval of 1 year, the 48 children were surveyed. Information was obtained on 44 of them. Of these, excluding 6 who were institutionalized, 27 (71 percent) showed improvement.

Since 11 of the 38 children actively treated did not receive the recommended treatment, for one reason or another, a comparison of this

group with those who did receive recommended treatment was possible, and the advantage of psychiatric consultation, Eisenberg pointed out, could be determined. Where the treatment plan was not followed, only 3 showed improvement (27 percent); where the treatment plan was followed, 24 showed improvement (89 percent).

These figures indicate, Eisenberg concluded, that a good consultation service for foster care children results in substantial improvement.

During treatment, several factors were uncovered relating to staff morale and the promotion of good consultation services. Agency workers, Eisenberg said, should be included in discussions and preparations of social histories without interposing psychiatric social workers between them and the clinic team. He also suggested that test analyses and clinical opinions should be expressed in clear terms, avoiding jargon. Remarks not relating to actual behavior may only confuse the agency worker or suggest difficulties beyond the scope of her abilities.

Epidemiological Method Measures Child Behavior

An epidemiological method for measuring behavior in children was reported by Dr. Rena Lapouse and Dr. Mary A. Monk, associates in preventive medicine and public health, University of Buffalo School of Medicine. Dr. Lapouse is also an associate in psychiatry.

Their report covered a pilot study of 482 children between the ages of 6 and 12. The sample used was representative of the population of Buffalo. The subjects thus were children "who are not likely to be picked out of the community for psychiatric examination and therefore have little chance of contributing to the statistics of symptoms."

Because of the general difficulty in differentiating reliably between normal and abnormal behavior,

Lapouse and Monk preferred avoiding definitions of pathological behavior. They developed instead "a method for measuring the prevalence and interrelations of certain behavior characteristics of children." The ultimate aim, they said, is to gain accurate knowledge of the prevailing forms of behavior of children, their frequency and severity, and their correlation with the adjustment and function of each child so that deviations from the usual pattern may be more objectively evaluated and, consequently, an effective method for identifying the psychiatrically sick child in the community may be evolved.

Mothers Interviewed

Mothers were used as the primary source of information on child behavior. Interviews, 1½ hours long, were designed to elicit information on the child as well as on certain family and household characteristics. Interviews were obtained with 94 percent of the sample. Information was sought on a wide range of child behavior including social and intellectual behavior, body control and coordination, habits, and physical and mental factors that modify or limit behavior. In a check on the validity of the mothers' responses, a new sample of 193 mothers with one child each was selected for interview. Mother and child were interviewed separately but simultaneously. Both groups were asked the same questions, and the responses were compared.

Since the pilot study was undertaken primarily to develop a valid and reliable epidemiological method

for the investigation of behavior in children, and since an analysis of only a small part of the data collected is reported, the actual findings are tentative, the authors said.

Responses Compared

With regard to the validity of the mothers' responses, Lapouse and Monk found that the mother's agreement with the child is highest when the behavior is concrete, objectively observable, or has a high nuisance value as measured by social standards. Thus mothers could be relied upon to agree more consistently with their child when reporting bed wetting, thumbsucking, stuttering, and so on.

There was far less agreement between mother and child on subjective behavior such as nightmares, amount of food eaten, restlessness, overactivity, or fears and worries. Indeed, 40 percent of the mothers, they found, underestimated the fears and worries of their children.

In the partial analysis of their data Lapouse and Monk observed that for a representative sample of children mothers reported a high prevalence of several characteristics commonly thought of as pathological. The authors raised questions as to the interpretation of this finding: whether it means that a large number of children are psychiatrically ill, or whether these characteristics occur in essentially normal children. It was suggested that the answer may lie in an evaluation of the children's capacity to function effectively in their environment. The authors plan to report on this aspect of their investigation in the future.

Water, Wastes, and Safety . . .

Public Health Hazards Created by Radiation

Developing sound criteria of maximum exposure of individuals and the general population to radiation

is at once vitally important and tremendously difficult, averred Roy J. Morton, associate leader, Waste Disposal Research and Engineering Section, Oak Ridge National Laboratory.

Morton reviewed the need for integrating radiation protection with public health practice and gave examples of the expanding use of nuclear energy. In addition, he discussed some of the aspects of control, specifically preventive control, of environmental exposure to radiation.

Need for Control

In the past, Morton pointed out, some people were seriously injured or killed by radiation from X-ray machines or other sources of radiation, and protective measures were left to specialists. Radiation control was an individual concern.

Today, ionizing radiation has become a community burden. Not only is there background radiation, but there is an accumulation of public dosage from exposure to radiation used in medicine, dentistry, industry, research, and weapons development. These sources of radiation are in addition to nuclear energy operations for which comprehensive radiation control measures have been provided to protect workers and surrounding communities.

"The basic public health responsibility is to maintain all radiation exposures within the generally accepted limits without in any way discouraging the utilization of radiation sources to their maximum advantage," Morton said.

Radiological Health

"Radiological health," Morton explained, "is generally accepted as the inclusive term for all public aspects of ionizing radiation in relation either to the prevention of injury to people or the uses of radiation and radioactive substances to improve public health. The primary goal of radiological public health is to avoid all unnecessary radiation exposure of human beings. It is impossible, of course, to limit exposure to zero, but exposures above zero should be regarded as undesirable and condoned only when the gain from such exposure warrants the risk. The minimum public health responsibility is to be sure that accepted

standards of maximum permissible dosages are observed including recommended limits for the total population which should be set at levels well below those that are acceptable for persons occupationally exposed to radiation."

Eventually, Morton believes, radiation control procedures will be integrated with established public health practice and will be handled in much the same way as other public health activities.

Health Problems

The use of X-rays, Morton said, constitutes the most urgent and widespread source of critical public radiation exposure. At the present, some of the aims, Morton indicated, are "to improve X-ray machines, installations, and techniques so as to minimize the radiation exposure of operators and patients." It has been demonstrated that familiar techniques can reduce individual diagnostic X-ray exposures more than 95 percent, and completely shield critical areas of the body, with no loss in utility of the X-ray picture.

The use of radionuclides in research constitutes a relatively minor source of exposure. The list of radionuclides, published by the Oak Ridge National Laboratory, now includes about 85 processed elements, with a half-life varying respectively from less than a day to millions of years.

Radionuclides are frequently employed as tracers, Morton said. Small quantities of short-lived radionuclides suffice for most tracer applications because of their sensitivity to counting methods, and hazards can be avoided by using small amounts of quickly decaying radioactive material. On the other hand, radionuclides as high level radiation sources may involve large amounts of radioactive materials and high radiation fields. The techniques of elaborate shielding and other safeguards for high level radiation uses have already been developed and evaluated, Morton said.

The greatest prospective source of radiation is the nuclear high-energy

power reactor, he said, but also noted approximately 25 low energy installations designed for use in research and training. The number of reactors is increasing rapidly. The source of radiation of most concern to the public is the fission product rather than the process of fission itself.

Unless fission is replaced by a fusion process, which creates no radioactive products, radioactive wastes will be one of the major concerns of radiological public health, Morton pointed out. By the year 2000, there should be "an accumulated volume of high-activity reactor fuel process wastes of the order of 550 million gallons and with total accumulated radioactivity of many billions of curies."

Industrial Uses Grow

Citing information from the Atomic Energy Commission, Morton indicated the rapid expansion of the Government's nuclear energy operations:

- Government investment in atomic energy plants and equipment increased from \$2 billion in 1951 to \$6.5 billion by July 1956.

- In fiscal year 1956, the Commission spent \$177 million on reactor development and related activities, nearly \$52 million of which was for civilian experimental power reactors.

- The AEC research and development program, exclusive of support to military projects, costs about \$250 million each year.

- In fiscal year 1956, \$18 million went to private contractors for some 800 research projects.

The 22d semiannual report of the AEC for January-June 1957, Morton pointed out, lists 267 reactor facilities that have been planned, or built, or are in the process of being built. Five full-scale civilian power reactors are being built and 17 are in the planning stage. Of the 22 chosen locations for these reactors, 16 are distributed in 10 States, Puerto Rico, and Alaska; 1 is in New England, 2 in the Ohio Valley, 1 on shipboard, and 2 are unspecified.

After advising against exaggerating and overpublicizing the promise and hazards of nuclear energy, Morton concluded that "the logical objective is to deal with the radiological health and environmental control problems as they now exist, to study and learn more about the fundamental factors involved, and to develop rational methods of control that are as conservative and adaptable as possible."

Clean Water Law Aids 700 Communities

About 700 communities were offered Federal aid and 600 others applied for grants during the first year the Federal Water Pollution Control Act of 1956 has been in effect.

Robert R. Harris, chief, Construction Grants Section, Water Supply and Water Pollution Control Program, Public Health Service, discussed this and other consequences of the legislation.

New facilities and improvements to existing sewage works costing more than \$250 million have already been aided by this act. Federal contributions for the first year reached \$56,237,000; a ratio of 4 local dollars to each Federal dollar, Harris stated. The law limits the Federal share of grants to \$250,000 or 30 percent of the cost, whichever is less.

He noted that the \$95 million appropriated for grants during the first 2 years is far short of the amount communities have already requested.

The Federal grants have made their biggest impact upon small communities, Harris stated. The first 127 Federally aided sewage treatment plants in 7 midwestern States will reduce pollution from municipal sewers in 1,700 miles of streams to satisfactory levels. Ninety percent of the communities these plants serve have populations under 25,000.

The legislation provides that half the grant funds must aid communities of 125,000 or less; 84 percent of the funds already allotted have gone to communities in this category.

State Participation

The most significant feature of the act, Harris said, is the reaffirmation by Congress of the States' primary right and responsibility to prevent and control water pollution. Federal activities primarily support and supplement the efforts of State and local agencies.

Municipalities wishing Federal aid must first apply to their State water pollution control agency. The State approves the application and certifies that the proposals it contains have priority over others in the State.

The act specifies that the priority must be based on financial as well as water pollution control needs. A Federal grant offer is made subject to the terms and conditions specified by the State and the Public Health Service.

Financing methods the communities have used depend upon their fiscal resources and State laws. General obligation bonds, certificates, or warrants payable from ad valorem taxes of a municipality are most popular. But revenue bonds and certificates and special assessment bonds have also been used. Often a community raises funds from several sources such as unencumbered cash, proceeds from several types of bonds, Federal loans, and grant moneys from State and Federal governments.

Several State governments now offer assistance to communities. Partly stimulated by the Federal Water Pollution Control Act, the Maine, Maryland, and Vermont legislatures in 1957 established supplementary grant programs. New Mexico voted special assistance to rural unincorporated areas, and Ohio created an emergency Village Capital Improvement Rotary Fund to make advances for planning.

New York, Pennsylvania, California, and Oregon already had some form of State assistance.

Law's Impact

The act contains broad definitions: treatment works include interceptor

and outfall sewers, pumping, power, and other equipment, as well as extensions, improvements, remodeling, additions, and alterations of existing treatment works; construction includes preliminary planning, necessary engineering, architectural, legal, and fiscal investigations and services, preparation of designs, specifications, and plans, and inspection and supervision of the construction.

As a result, Harris said, many treatment works not otherwise possible are being built through combined Federal, States', and local governments' efforts.

The Federal grants already offered will aid sewage treatment plants serving 10,500,000 people and an estimated 14,000,000 in the future. Harris pointed out, however, that some 9,000 communities need new or improved facilities.

The Nation's annual per capita expenditure for construction of municipal sewage treatment works is about \$2.42, based on the 1950-54 average. Even if this rate is maintained until 1985, the population equivalent of sewage still delivered to streams then will be 25 million higher than it is today, Harris stated.

Bonds Finance County Water, Sewage Plants

Methods used to finance the 97 sewage treatment plants and 150 water plants in Harris County, Tex., were described by Roger Moehman, sanitary engineer, Harris County Health Unit.

Outside Houston, with its 900,000 population, 200,000 people live in small cities and unincorporated areas where suburban development has mushroomed since 1915. In these fringe areas 15,000 lots were subdivided in 1955, 13,000 in 1956. Water supply and sewage disposal facilities were lacking, and most suburban developers had to provide these services for their own subdivisions.

Septic tanks and shallow wells

WATER AND SEWAGE

were eliminated in most developments by policies of the Federal Housing Administration, Veterans Administration, and loan companies. The agencies did not insure or the companies lend money for purchasing homes unless the Harris County Health Unit approved sewerage and water systems. The unit also inspected and approved plants built according to plans approved by the State health department. Sewage disposal systems are required to have a complete treatment plant; often effluents flow into dry ditches or streams with inadequate flow.

Financing Methods

Water and sewerage systems in Harris County were financed through city systems with city bonds, water control and improvement districts, fresh water supply districts, and private capital, Moehlman stated.

Under Texas legislation a State board of water engineers can create a water control and improvement district after hearings called upon petition from those living or owning property in an area. Subsequently, elections are held to approve the district and to vote bonds for financing the construction of facilities.

In both water control and fresh water supply districts, general obligation bonds are voted; interest rates on these bonds can be lower than those based on revenue alone, and they are more marketable.

Fresh water supply districts are established by filing a petition with the county commissioners court. The court, after a hearing, can create the district. Elections are then held to approve the district and vote financing bonds.

Originally, the fresh water districts were formed when effluents from septic tanks and privies caused pollution. Some Harris County subdividers, however, set up districts for their development before building many houses. The districts can be created with only five people in the area to vote the money for the

entire subdivision's water and sewerage systems.

This district's advantages: its bonds can be sold and the subdivider need not keep money invested in facilities; bonds sold at 90 percent of face value often go to par or above when a city assumes the district's obligations; a city can annex a district simply by assuming the system's liabilities and operation.

Subdividers unable to borrow money to install water and sewerage systems in their developments used their own funds to provide these services.

Subdividers obtained services by arranging with a contractor to install the water supply system, sewerage, paving, and street lights in return for a lien on the property, by putting in water and sewage lines so that existing systems could be extended to the new developments, or by building and operating these services themselves.

These private systems, although planned in their entirety, generally were built piecemeal. Lines were installed as needed and some sewage treatment plants were constructed in stages, although providing complete treatment at each stage.

Similarly, water lines were put in street by street, and water supply plants began with one well and pressure tank, adding tanks with high lift pumps, additional wells and storage tanks, or another plant as needed.

These methods were developed over several years. When the county's suburban development began, each subdivider financed water and sewerage systems his own way. The subdividers realized the advantages of community systems over septic tanks and private wells, although the initial cost was about the same.

During the building boom, many water and sewerage systems made money in their first year of operation. Now, however, Moehlman said, building rates seem normal or below normal in Harris County, fewer homes are sold, and small pri-

vate utility operations take longer to become self-supporting.

Survey Made

A survey of installation costs, operating costs, and revenues showed that installing water and sewage disposal services in districts where homes were already built cost more per connection than when the subdivider constructed the facilities.

The developers built on every lot in their subdivision, while the water districts serve only existing homes. One water district had facilities for 2,780 lots, but only 1,230 homes were connected to the lines after a year's operation.

According to Moehlman, installing water and sewage facilities in the water district cost \$348 per lot, in the subdivision, \$340. But the cost per connection in a water district was \$700, while the subdivider paid a smaller sum for each connection, he pointed out. The district's taxes and other revenue must offset this larger capital outlay and yearly expense. However, as more homes were built on once vacant lots, taxes and rates decreased.

The privately owned systems adopted existing city or water district rates without knowing operating costs or potential returns. Competing subdividers offered free water for a year as a buyer inducement, or halved rates to nurture beautiful green lawns in one development.

With careful planning, engineering, construction, and operation, even small water and sewage disposal systems need not be a detriment, Moehlman declared.

He concluded that Harris County's numerous water and sewerage systems for the subdivisions were not ideal. In some ways the multiple systems are only a step above using septic tanks and private wells. But they suit the county's present situation.

Ultimately the city of Houston could annex all these systems and eliminate many small sewage treatment and water supply plants.

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Septic tanks and shallow wells

The pH also affects pressure. A 5.5 pH is usually maintained for well injection. To improve filtration the pH was raised to 6.0 or 6.5. But the pH increase raised the maximum pressure to 900 or 950 pounds. Returning to a 5.5 pH brought the pressure to 800 within a couple of months. This indicated to Wallace that a low pH was necessary to maintain the openings in the strata through which the waste is injected.

The injection process also works against the normal head of approximately 750 pounds needed to push the waste into the voids. Wallace believes the present wells will continue to operate satisfactorily until the void is filled.

Sanitation Experts Can Cut Accidents

Accident prevention is the responsibility of the total public health program, and the local environmental health group has several opportunities to make a major contribution, according to Eugene L. Lehr, chief, Program Services, Accident Prevention Program, Public Health Service.

The skills of the public health engineer and sanitarian in observing and correcting environmental sanitation hazards may be readily extended to environmental accident hazards. There are six stages, Lehr suggested, where accident prevention measures may be applied with environmental operations:

1. In the investigation of nuisance complaints the concept of home safety can be brought directly to the attention of households.

2. When food processing or handling plants are inspected, safety can be promoted as well as cleanliness.

3. Sanitarians conducting insect and rodent control have the opportunity to detect accident hazards and to advise or assist on corrective measures. At the same time, they also have the opportunity of exploring the subject of accidental poisonings.

4. Since the sanitation section frequently plays a leading role in the regulation and inspection of institutional facilities it has the opportunity to detect and eliminate accident hazards there.

5. Recreational facilities, especially neighborhood and private swimming pools, require more than advice and assistance on water treatment. They are sources of many accidental injuries.

6. Finally, the sanitary engineer and sanitarian can contribute materially to the study of housing in his community, and to the establishment of neighborhood improvement campaigns, urban rehabilitation programs, and housing codes designed to prevent the deterioration of existing housing as it ages and as conditions of occupancy change.

Aerosol Methods Applied To Drinking Fountains

Aerosol studies will tell us if drinking fountains are a potential vehicle of disease transmission, according to Dr. W. N. Mack, professor

of microbiology and public health, Michigan State University.

Preliminary investigations show, Mack said, that viable virus particles can be recovered by the aerosol method. After feeding T₂ bacteriophage into an angle jet stream of a drinking fountain, 630 liters of air from surrounding areas were collected at 5-minute intervals, 14 inches above the rim of the bowl. Three samples out of five contained 2.1, 52.0, and 2.3 virus particles per liter of air tested.

Aerosols from the splash of the drinking fountain produced inconstant amounts of virus, Mack said, because drops of water from the fountain were influenced by the sampler's air flow, and the fountain did not produce an evenly dispersed atomization of virus. The distance at which viable virus particles may be collected, he reported, is at least 48 inches from the apex of the stream and in the opposite direction from the flow.

To determine whether the drinking fountain is a potential health hazard or not, Mack pointed out that the sanitarian need only apply the available tools and methodology.

Chronic Diseases . . .

National Program Aids Cancer Chemotherapy

The national cancer chemotherapy program, initiated in 1953, comprises one of the greatest mobilizations of resources ever undertaken to conquer a single disease, said Dr. Kenneth M. Endicott, chief, Cancer Chemotherapy National Service Center, Public Health Service. Both government and private agencies have joined forces in this program of accelerated research on cancer chemotherapy through encouraging voluntary cooperative studies in certain areas and at the same time supporting individual investigators

Sponsoring agencies of the program are the National Cancer Institute, the American Cancer Society, the Damon Runyon Memorial Fund for Cancer Research, the Veterans Administration, the Atomic Energy Commission, and the Food and Drug Administration.

Program Organization

One of three groups under which the program has been organized is the Cancer Chemotherapy National Committee. This policymaking group is composed of a member from each of the sponsoring agencies, a member-at-large, and a member from the pharmaceutical industry.

Another group is the Industry Sub-

However, pending any such move, fringe areas outside the city will need more small plants, he said.

Perhaps a countywide sanitary district to handle all water and sewage disposal services would be best, Mochlman stated.

Attempts Made to Measure Effects of Air Pollution

Air pollution in many cities around the world has created a substantial health problem, said Dr. Lester Breslow and Dr. John Goldsmith, bureau of chronic diseases, California State Department of Public Health.

But, they went on to say, "if we are to attack air pollution as an environmental influence detracting from health as well as causing disease and death, then it seems desirable to measure the extent to which it does interfere with well-being."

In 1956, in an attempt to measure the effects of air pollution on health, the California State Department of Public Health sampled 3,545 households. Forty percent stated they were bothered by air pollution. In Los Angeles County, 60 percent reported various unpleasant physical reactions. The surveyors found that 1 out of 8 Los Angeles households was considering change of residence because of air pollution, while some were thinking of changing their jobs for the same reason. Commenting on this situation, Breslow and Goldsmith said, "Interference with well-being to the point of changing residence or job represents a disruption of health which certainly qualifies smog as a public health problem."

The possibility that air pollutants are causally related to lung cancer and respiratory diseases has led to several studies here and abroad, and, the authors noted, the English have had some success in relating chronic bronchitis to air pollution.

Attempts to measure the relationship of air pollution to chronic diseases in this country, however, have

not been conclusive, according to Breslow and Goldsmith. An investigation in 1956 to confirm the impression that episodes of smog precipitate asthma was inconclusive.

Since 1954 the California State Department of Public Health has been studying daily mortality data from Los Angeles, but has not as yet demonstrated any effect of air pollution on mortality. A special study of 4,000 nursing home patients, who, the authors believe, would quickly reflect any adverse environmental condition, has revealed no definite effect on mortality from air pollution alone. But, the authors admonish, this does not mean that no effect occurred.

Present knowledge of the health implications of air pollution demands strenuous control efforts, but Breslow and Goldsmith stressed the fact that "research on the health effects must be pursued with equal vigor in order to identify the aspects of air pollution which are most dangerous to human life and well-being."

Deep Wells Found Practical For Waste Disposal

Deep wells are the cheapest, most practical method of disposing of chemical waste, stated W. H. Wallace, fine chemicals department foreman, Upjohn Company, Kalamazoo, Mich. The company now pumps 25 million gallons of waste per year into the substrata at a cost of \$2 per 1,000 gallons.

The firm turned to wells in 1954 when the swampy area, previously used for disposal of wastes from fine chemical production and processing, became seriously contaminated.

It is generally agreed that a successful disposal well must be located in a favorable geologic structure, such as sedimentary rock formations, including sandstones, limestone, and dolomites, he said. These strata are often several thousand feet thick in the North Central States. Their porous capacity is large; wells pump

into a substrata approximately 15 percent void.

Disposal Wells Favored

According to Wallace, Michigan's State regulatory body, the Water Resources Commission, favors using disposal wells if they are cemented in and properly constructed. The State's geological division does not fear contamination of the potable water strata when the disposal well discharges at 1,000 feet below the well water aquifer.

The company's first disposal well, drilled in 1954, was an 8-inch well with a 7-inch steel casing inside and the area between sealed with concrete. As additional protection against contamination, waste is pumped through a 2-inch, high-pressure line, sealed at the top and bottom of the well. A leak in this line is instantly detected by watching the pressure developed in the annular space.

The cost of the well method is higher than the cost of biological disposal. But the large amount of lime neutralizer used was also necessary in the previous system, because the concentrated waste has an extremely high chemical oxidation demand. Liquid waste must be neutralized, clarified, and filtered before being pumped into the wells. If another well and injection pump were added, the cost per 1,000 gallons would decrease since the present labor force could handle 50 to 75 percent more volume.

Useful Life

Disposal wells always lead to the question of how long they will last. Upjohn may have a partial answer from its 3 years' experience.

The company uses 2 high-pressure injection pumps operated together and singly, 6 days a week, and records each day's maximum and minimum pressure. At the start, the maximum pressure was approximately 980 pounds per square inch and the minimum, 500. Today the maximum has dropped to 800 pounds, but the minimum is 750.

given in effective dosages, he said. The cooperative studies, Moore advised, should yield valid information in the shortest possible time with the least possible risk to patients.

In the first studies, cancers of poor prognosis were selected for observation. The parallel investigations at a large number of hospitals were planned to insure an adequate number of study patients within a 1-year period.

Triethylenethiophosphoramide (TSPA) is under test in conjunction with surgery for carcinoma of the stomach in one study. A second study concerns the use of nitrogen mustard in patients with resectable lung cancer.

Under consideration are studies of colon and rectal carcinoma and breast cancer, using TSPA, and cancer of the ovary, using an alkylating agent or radioactive isotope.

Study Protocol

Moore outlined as representative the protocol of the gastric cancer study, followed in the separate investigations by the various hospitals. Patients with nonresectable lesions or physical conditions that indicate increased risk to chemotherapy are excluded. Eligible patients are assigned by random selection to experimental and control groups, with the assignment unknown to the surgeon until after completion of the excision.

At surgery the scheduled dosage is administered into the systemic vein and into the peritoneal cavity before closing the abdomen. Post-operative dosages are given intravenously on the 1st and 2d days.

Followup examinations are designed to obtain immediate information on the effect of the chemotherapeutic agent upon the blood-forming system and to yield subsequent information on survival. Survival was adopted as the only criterion of effectiveness.

Moore stressed the importance of the central statistical unit, which must provide the randomization techniques, index patients admitted to the study, check on the accuracy

of the data gathered, verify survival periods, and, finally, assess the value of the therapy.

Final assessment of Triethylenethiophosphoramide as an adjuvant agent against carcinoma of the stomach should be possible within 2 years after completion of the study, Moore said.

Environment Holds Brain Tumor Clue

The first study on the epidemiology of tumors of the central nervous system showed that an environmental factor may be associated with these tumors, according to Dr. Thomas F. Mancuso, chief, division of industrial hygiene, and Dr. Elizabeth Jackson Coulter, chief statistician, division of vital statistics, Ohio Department of Health.

The authors, using data on residents of Ohio, 25 to 64 years of age, who died of tumors of the central nervous system during the period from 1944 to 1952, found variations according to geographic location, population group, and industry. Death certificates, histological examinations, X-rays, angiograms, and ventriculograms were the sources of their data.

High Urban Rate

Data on residence of white males showed that the 8 metropolitan counties had a standardized mortality ratio of 110.1, that 7 urban counties had a 97.3 ratio, and that the remaining 73 rural counties had an 84.4 ratio compared with the whole State. Counties were classified as metropolitan if they had cities of 100,000 or more; as urban if they had 50,000 or more persons living in urban areas.

In Summit County, Ohio, deaths of white men due to brain tumors were significantly higher than expected on the basis of mortality experience in the State—77 compared with 53.5. For white men, Summit County's average annual

age-adjusted rate, 8.06, was the highest among Ohio's 8 metropolitan counties, whose total rate was 6.26.

The metropolitan counties had 602 deaths due to tumors of the central nervous system among white men, and 415 among white women of the same age group during the 1944 to 1952 period.

These counties, the authors also found, had a higher average annual mortality rate per 100,000 for men than for women. The age-adjusted rate for the counties for men was 6.26 compared with 4.22 for women. In each county the rate for men exceeded that for women.

Mancuso and Coulter compared average annual death rates per 100,000 for native white, foreign born white, and nonwhite males. The age-adjusted rate for foreign born was 5.89, for native white 4.25, and for nonwhite, 3.17.

Data on length of residence in the metropolitan counties at the time of death showed 45 of 81 foreign born white males and 215 of 367 native white males died after 20 or more years of residence.

Industry as a Factor

Variations by industry and length of employment were also factors in deaths from brain tumors, the authors reported. Their statewide data covered 934 white males who died of tumors of the central nervous system in the period 1944-52. The employment histories of each death were reviewed to determine the industry in which the person worked in 1939, by age at that time.

In addition, the period of employment in the industry recorded in 1939 was determined. Industry rates of employment in 1939 were computed on the basis of population data in the 1940 U. S. census and adjusted for age on the basis of the total population of continental United States.

Deaths due to tumors of the central nervous system were identified in three major industry groups of agriculture, construction, and manufacturing. Within the manufactur-

committee which advises on industrial problems and promotes industrial participation in cancer chemotherapy research. It is composed of industrial research executives who serve as private individuals and not as company representatives.

The Cancer Chemotherapy National Service Center, the third group, has a full-time staff which administers the program recommended by the national committee, organizes and operates the needed technical advisory panels, arranges for the exchange of information, promotes cooperation among scientists, and otherwise implements the national program.

The existing program is a mixture of empiricism, exploration of existing leads, and support of that basic research which appears to offer the possibility of yielding useful information, Endicott stated. At present too little is known of the nature of cancer and the agents that temporarily inhibit its growth to allow discarding any likely material without at least a preliminary trial, he said.

National Service Center

To give the program direction, the center established five technical advisory panels: chemistry, screening, pharmacology-biochemistry, endocrinology, and clinical studies.

Some 45,000 materials are sent annually to the center for antitumor test by research organizations, universities, and pharmaceutical and chemical companies. These materials are screened against three types of mouse cancer—sarcoma 180, carcinoma 755, and leukemia L1210—especially chosen for their ability to indicate anticancer agents. Six screening laboratories are under contract to the center, and negotiations are under way with several pharmaceutical companies for implant screening.

For the development of better screening methods, microbiological methods, tissue culture, and human tumors in animal hosts are under study. Also being sought are reliable biochemical techniques for in-

dicating the cancer destroying properties of chemicals, hormones, and antibiotics.

When a pharmacological compound is found to have anticancer activity in the screening, animal studies are made to see what happens to the drug in the body. Before human trial is initiated, proper dosage and toxicity are determined.

Clinical trials are made by 11 cooperative study groups which represent more than 100 medical schools and hospitals in different parts of the country. End results are analyzed through tumor registries which are set up to provide data annually on all types of cancer and to undertake special studies on the effect of various treatments.

For better communication of research findings, a documentation center for information on cancer chemotherapy has been established at the center. A current bibliography, beginning with 1946, is available, and a series of reports are being issued to qualified investigators.

Other services offered by the center include procurement of chemicals and radioactive compounds for research purposes, arrangements for screening, pharmacological studies, and arrangement of interinstitutional cooperative clinical trials for large-scale evaluation of promising compounds. Information on technical problems as well as on grants, fellowships, and travel funds is also provided.

Industrial participation, which has been mainly limited to the submission of compounds, will be expanded through contracts made possible by recent congressional appropriation, Endicott reported. Firms will undertake research and development projects as well as "target" or applied programs. Work will cover implant screening, syntheses of potential anticancer agents, pharmacology, methodology, and other phases of drug development.

Evidence that the clinical course of cancer can be influenced by chemicals has aroused the interest and support of the pharmaceutical industry, research organizations, private

investigators, and the Government. The cooperation of these groups makes possible a continuous, concerted effort toward the chemical control of cancer, Endicott concluded.

Anticancer Agents Tested As Surgery Adjuvant

The efficacy of anticancer agents as an adjuvant to excisional surgery is on trial at a group of university surgery departments and a group of veterans hospitals.

These closely supervised studies, organized in November 1956 under the auspices of the Clinical Panel of the Cancer Chemotherapy National Service Center, were described by Dr. George E. Moore, director of the Roswell Park Memorial Institute, Buffalo, N. Y.

Surgery, even when all gross evidence of the tumor is removed, and irradiation of the operative area do not cure all patients, Moore said. He pointed out that free tumor cells may spread through the lymphatic and vascular systems, or they may exfoliate into a body cavity. About half of the blood samples obtained from veins draining malignancies of the lung and gastric intestinal tract contain tumor cells, he reported.

Moore termed logical an attempt to destroy by chemical compounds the widespread cancer cells remaining after surgery since the majority of patients die from metastasis of the cancerous cells rather than from local recurrence.

In experimental work, he reported, chemotherapeutic agents have been effective against unestablished tumors, although they were ineffective in curing the same type of established tumors.

Highly Toxic

Moore warned, however, that adjuvant chemotherapy has not been established and is not recommended for general use. With few exceptions, all compounds active against tumors are extremely toxic when

225 cases were identified as actual cases through records or interview.

202 cases qualified under Jones' diagnostic criteria.

113 cases were in females, 112 in males.

152 cases were in children under 15 years of age.

41 of the physicians were general practitioners, 15 internists, 7 pediatricians, and 2 surgeons.

Interview data from 240 physicians who did not return questionnaires showed:

74 physicians treated 177 cases of rheumatic fever.

158 cases qualified as actual cases under Jones' diagnostic criteria.

65 cases were in females, 112 in males.

114 cases were in children under 15 years of age.

105 of the physicians were general practitioners, 30 surgeons, 28 internists, 10 pediatricians, and 67 others eye, ear, nose and throat specialists, dermatologists, psychiatrists, urologists, orthopedic surgeons, obstetricians, gynecologists, or radiologists.

Reports from the two groups of physicians showed differences in percentages of cases meeting Jones' major and minor criteria for rheumatic fever.

But in the reporting group 52 percent of the cases met 2 major criteria, and 38 percent met 1 major and 2 minor criteria. In the nonreporting group 45 percent of the cases met 2 major criteria, and the same percentage met 1 major and 2 minor criteria. Under Jones' criteria 90 percent of the cases in both groups qualified as rheumatic fever.

In both groups general practitioners diagnosed and treated 75 percent of the cases and internists and pediatricians 20 percent. Two-thirds of all cases of rheumatic fever occurred in children under 15 years.

Conclusions

The followup studies, statistically designed to confirm or revise the

2,297 cases originally reported in the survey, proved to Rosenfield that 1,650 cases were actually treated by the entire group of physicians returning questionnaires.

The interviews with the 240 physicians who had not returned questionnaires showed 74, or 30.8 percent, had treated rheumatic fever, while 597, or 39.3 percent of those replying in the survey, reported cases. This indicated the 1,507 non-responders in the original survey treated approximately 1,000 cases.

Rosenfield concluded that Minnesota had 2,600 cases of rheumatic fever in 1955, that the disease continues to be prevalent in the State, and that it constitutes a serious hazard.

Recurrence Rates Decline For Rheumatic Fever

Rheumatic fever recurrence rates in patients aged 2-20 years showed a decline during a 21-year study, 1936-56, conducted at the New York Hospital cardiac rheumatic clinic.

According to Dr. May G. Wilson, Dr. Wan Ngo Lim, and Dr. Ann McA. Birch, all pediatricians with the Cornell University Medical College, the decline appeared to coincide with progressive improvement in socioeconomic status for the observed patients.

The downward trend in recurrence rates antedated the antimicrobial era and did not appear to be sharper

for 1952-56 when antibiotics were administered either therapeutically or prophylactically, the authors stated.

During the study period 782 children, who contributed 5,663 person-years, had a total of 613 recurrences, giving a crude overall rate of 10.8 percent per year. Twenty-one consecutive annual recurrence rates at ages 2 to 20 years gave a mean rate of 9.8 percent per year. There was a statistically significant downward trend, with a slope of -0.4 percent per year, in the annual recurrence rates from 1937 to 1956. The individual rates for 1936-41 were significantly above the mean rate, and significantly below for 1955-56.

The approximate chance of a recurrence in any one year for all children 6 to 13 years of age declined from 1 in 4 before 1944 to 1 in 7 between 1944 and 1956. For those aged 14 to 20 years the chances fell from 1 in 16 to 1 in 35.

General improvement in the standard of living in Greater New York City during the years 1936-56 was reflected in the socioeconomic composition of the clinic population, the authors stated. They explained that the relative percentage of patients in the best environmental group increased, and those in the poorest socioeconomic status decreased. Recurrence rates were generally lower in the more favorable environmental group, and for the poorest environmental group the rates did not follow the decline noted for the total clinic population.

Dental Health . . .

Fluoridation System Devised for Home Use

Users of private water supplies may soon be able to enjoy the benefits of fluoridated drinking water, according to statements by F. J. Maier, sanitary engineer, Division of Dental Public Health, Public Health Service.

For the past 2 years, a device for fluoridating individual water systems has been in use in four suburban homes in Maryland. Fluoridation has been accomplished with the utmost safety and with remarkable consistency and precision, the report indicated.

Indispensable to satisfactory operation of home fluoridation equip-

ing group approximately 10 specific industries were studied. The result showed considerable variation in rates. The lowest rate for the three broad industrial groups occurred in agriculture. Several specific manufacturing industries, on the other hand, showed relatively high mortality.

On the basis of their data, Mancuso and Coulter concluded that exploration of environmental factors may provide clues to the etiology of tumors of the central nervous system.

Finds Ethnic Extremes In Cervical Cancer

Cancer of the uterine cervix is nearly four times as common among non-Jewish white women of New York City as in Jewish women of either New York or Israel.

Incidence rates are consistently low for cancer of the cervix—4.8 per 100,000—among Jewish women in both areas although habits, customs, and geographic origins of the two groups are not identical. By contrast, the rate for non-Jewish white women in New York City is 17.3, and it is 39.1 for selected urban areas in the United States.

These findings were reported by Dr. Lucia J. Dunham of the Laboratory of Pathology, National Cancer Institute, from studies pursued with Dr. Harold F. Dorn, chief, Biometrics Branch, National Institutes of Health.

Cervical cancer seems to be a frequent form of malignancy in Puerto Rican and nonwhite women, according to Dunham and Dorn. The incidence for Puerto Rican women was 111.3 per 100,000 while the rate for nonwhite women was 54.5 per 100,000 in the groups studied in New York City.

Individual interviews of patients were conducted to obtain information on social, medical, surgical, menstrual, marital, and pregnancy histories. A total of 3,514 women, including 2,418 Jewish women and

1,096 non-Jewish white women, were interviewed between 1951 and 1953 in New York City and Israel. Fewer than half of them had cancer. The remainder were hospital patients without cancer, interviewed as control cases.

Dunham and Dorn emphasized that this is a preliminary report on the methods used in a study of women with uterine cancers in different geographic areas and racial groups. "We hope a scientific basis will be established for the study of factors which may shed light on reasons for differences in cancers of the uterine cervix in several population groups," they said.

Cytological Facilities For Cervical Lesions

A widespread deployment of cytological diagnostic facilities would be of invaluable assistance in the early detection and treatment of cervical lesions, presumed to be a preinvasive form of cancer. Of equal importance, these facilities would enable us to arrive at an understanding of the biology of cervical carcinoma and its epidemiology.

These were the main contentions of Dr. John K. Frost, assistant professor of gynecology, Johns Hopkins School of Medicine, and associate professor of pathology, University of Maryland School of Medicine, Baltimore.

Through the use of exfoliative cytology, he said, the preinvasive form of cervical cancer has been detected in 97 percent of the women in whom it is known to occur. This may be contrasted with the disappointingly infrequent detections by physical examination alone.

Cytological detection of these lesions of carcinoma-in-situ, has resulted in early treatment, which Frost believes has contributed increasingly to the conservation of life.

But there is still some distance to go, Frost observed, before the biological behavior of cervical lesions

is completely understood. Establishing adequate cytological diagnostic facilities would shorten that distance considerably.

Rheumatic Fever Cases Exceed Morbidity Reports

A study of rheumatic fever prevalence in Minnesota showed that 2,600 cases were diagnosed and treated in 1955, although 187 cases is the State's yearly reported average (1950-54).

Reporting of the disease is required by law, but such reporting is known to be incomplete, stated Dr. A. B. Rosenfield, director, division of special services, Minnesota Department of Health, who made the study.

To obtain accurate information on prevalence, Minnesota's Heart Association, the State Department of Health, and the Heart Committee of the State Medical Association sent questionnaires to 3,063 State Medical Association members in September 1955.

In 1,519 replies, 597 physicians reported 2,297 cases over 12 months, averaging 3.8 cases per physician reporting cases.

The large number of cases reported in the survey and the small number reported to the State health department raised two questions, Rosenfield declared. How many of the 2,297 cases were actually identifiable? How many met accepted diagnostic criteria for rheumatic fever?

Physicians Interviewed

To find the answers, 65 physicians (11 percent) who reported 13 percent of the cases in the survey and 240 physicians (16 percent) who did not return questionnaires were interviewed. Case records were also reviewed and data abstracted on a checklist of Jones' criteria for diagnosis of rheumatic fever.

Interview data from 65 physicians who returned questionnaires showed:

281 cases of rheumatic fever were reported.

same kind of care he customarily applies to other water treatment processes.

Accuracy in fluoride feeding may be difficult in some instances, but it is never impossible.

Major direct responsibility for surveillance of the fluoridation process belongs to the health department engineer. Dentists, however, are indirectly accountable, the report pointed out. They have predicted and promised benefits. Their indifference to the necessity of maintaining a precise fluoride level could bring them discredit should fluoridation be condemned because inadequate procedures produced inadequate results.

Responsibilities for Dental Hygienists

Increased responsibilities would attract more dental hygienists to public health service, commented Martha Howard Fales, dental health coordinator, Brookline, Mass.

The primary reason for the shortage of dental hygienists, Fales maintained, is that few are given the opportunity to use their capacities to the full, with the result that their work seems unattractive.

Recruitments, Fales said, are not replacing those lost through death or retirement. As a result, more and more public health dentists have had to undertake duties normally performed by the hygienist.

Responsibilities, Fales observed, may be added to the dental hygienist's role according to the level of competency. There are three such levels: the certificate dental hygienist, the dental hygienist with a bachelor's degree, and the dental hygienist with graduate training in public health. Fales suggested the following responsibilities that could be assigned to each level of competency.

Certificate Dental Hygienist

Educate patients, particularly children, in dental procedures and dental health facts.

Educate patients in the requirements and routines of the clinic.

Screen clinic cases from referrals to private dentists.

Conduct community dental surveys.

Take roentgenograms for community surveys or for research studies as well as in the clinic.

Do all prophylactic work for clinic patients or for demonstration programs.

Make topical fluoride applications.

Make occlusal evaluations, code findings, and make models.

Take charge of clinic supplies, and inform staff of availability of new materials.

Degree Dental Hygienist

Screen patients; record and interpret findings for others.

Compile data on clinic functions and activities for the director.

Undertake major load of school dental health programs.

Provide and interpret information for local groups.

Act with or for the director in planning community projects.

Work with welfare, volunteer, and veterans' groups.

Lecture before training schools and supervise field training experience.

Graduate Dental Hygienist

Administer town or county dental programs, coordinating the work of advisory dental committees with dental clinic programs.

Participate in program planning and evaluation.

Recruit for staff openings.

Train new personnel.

Help prepare annual reports and budget.

Arrange field training visits and institutes.

Work with dental hygiene training schools and teacher training colleges.

Urges States to Meet Dental Deficiencies

The inadequate supply of dentists and dental hygienists makes it man-

datory for State health agencies to play a larger role in dental health activities than they have up to now, commented Dr. Wesley O. Young, director, division of dental health, Idaho State Board of Health.

State health agencies, Young said, must stimulate interest and action, coordinate joint cooperative action on State, regional, and national levels and serve as a source of technical information.

Since the basic objective of public dental health is to improve the oral health of the public through community activities, it is imperative, Young asserted, that the supply of dental personnel be increased and the available resources be fully utilized in order to meet that objective.

Various attempts, Young noted, have been made to meet the widespread lack of dental manpower. Fluoridation and emphasis on child dental care are two activities undertaken to reduce anticipated patient loads. In the western States, to which Young turned for his examples, expansion of present facilities, reorganization of various units, and creation of new methods have been the principal activities in meeting the problems of dental manpower shortages.

In Colorado, Young said, the new dental school being built there will be, through the efforts of the State dental society, regional in character and will serve the entire Rocky Mountain area. In Idaho, the State dental society has provided scholarships for students of dental hygiene, and plans have been developed to expand one of the universities to include a dental hygiene school. This school will offer courses leading to a certificate or a degree in dental hygiene. In Nevada, the uneven distribution of its population resulted in inadequate dental care in sparsely populated regions. To serve these relatively isolated areas, the State dental society purchased a fully equipped dental trailer.

In order to provide adequate dental manpower, four basic steps must be taken, Young said: (a) de-

ment is proper maintenance, Maier said. A service to provide fluoridated water similar to services now providing chlorinated water, softened water, or bottled water was recommended as a practical and profitable enterprise.

The tasks of a fluoridation service would include analysis of the untreated water; provision, installation, and maintenance of equipment; periodic inspection of the installation, replenishment of the fluoride solution, and adjustment of the dosage; and eventually removal of the equipment.

The cost for the service, including a \$1.50 profit, is estimated to be \$3.00 per month. It could be less, depending on the number of customers, distances traveled in servicing the equipment, and the like.

So far fluoride-feeding devices are available only for homes with electrically driven pumps which discharge into a pressure tank, but devices can be developed for other types of private water supply systems.

In the Maryland experiment, two types of feeders have been tried. One is actuated by a solenoid which is energized periodically through a rectifier by means of an electric timer. The other is hydraulically operated, the driving energy being derived from the water pressure in the distribution system.

These two types, both commercially available, appear to be equally accurate, but the hydraulic model seems to operate more smoothly, according to Maier. With the hydraulic model, he pointed out, there is no possibility of operation when the pump switch is on but no water is being delivered.

During most of the testing period, the units were serviced each month, although replenishment of fluoride solution was not required for about 3 months. Minor repairs, such as replacement of fuses, repair of leaks, or replacement of plastic parts, had to be made occasionally. These affected the continuity of feeding, but they did not affect at all the

safety of the procedure from the standpoint of overdosing.

Maier estimates that currently about 20 million homes housing 60 million people have private, individual water sources, and he believes the proportion is increasing slightly each year.

Topical application of fluorides, use of bottled fluoride water, and use of pills containing fluoride are among the methods suggested for bringing the benefits of fluoride to these people. But these methods, according to Maier, are expensive, difficult to administer, or hazardous in comparison with fluoridation of the water supply.

All known experience and information indicate that fluoridation of the existing water supply is the best method from the standpoint of both safety and effectiveness.

Precision in Fluoridation Judged a Necessity

Maximum benefit to teeth from fluoride depends on maintenance of the fluoride content of the water supply at the established optimal level, declared Grace C. Scholz and Floyd B. Taylor, of the Public Health Service, and W. L. Harris, water plant supervisor in Grand Rapids, Mich. Miss Scholz is chief of statistical services, Division of Dental Public Health, and Mr. Taylor is sanitary engineer, Division of Sanitary Engineering Services.

Reporting a study which revealed that two cities failed to keep the fluoride content up to the desired level, they urged periodic, current determinations of fluoride content and immediate correction of deficiencies. They recommended simple statistical analysis of series of water test results, preferably at intervals not exceeding 3 months.

Fluoridation as a public health measure will not be judged by the maximum results that a properly conducted study can effect but by its actual achievement in preventing dental caries in all communities where it is practiced, they warned.

It was observed that State health departments frequently establish recommended levels of fluoride concentration and a maximum level that is never to be exceeded, but that little concern is evidenced when fluoride concentrations fall below the recommended level.

The study was conducted in two unidentified cities in the east and in Grand Rapids, Mich. It was based on water sample analyses performed and recorded as part of normal plant operations.

Grand Rapids achieved remarkable precision in meeting the objective of 1.0 to 1.1 p.p.m. fluoride. In clearwell samples, the mean fluoride content during a 10-year period was 1.07 p.p.m., with a standard deviation of only 0.06 p.p.m. Findings for samples from the distribution system during the same period were comparable.

The two eastern cities, however, fell far below their fluoridation aim. In one the mean for samples from the distribution system collected during a period of more than 2 years was 0.62 p.p.m. with a standard deviation of 0.23 p.p.m. This city ceased fluoridation by action of the governing council following suspension of the procedure by the water superintendent.

In the other eastern city, the mean for distribution system samples was 0.66 p.p.m., and the standard deviation was 0.41 p.p.m., indicating a wide variation in the readings. Samples collected at the pumping station during a portion of the same period showed a mean of 0.76 p.p.m. and a standard deviation of 0.32.

Officials in this latter city introduced corrective measures, and a subsequent 6-month series of samples showed improvement. The mean was 0.88 p.p.m. with a standard deviation of 0.26 p.p.m.

It was noted that the fluoridation experience of the two eastern cities is not unique.

Fluoridation procedure presents no unusual technical difficulties, the report stated, but it requires that the water plant operator exercise the

ords, recruitment and utilization of personnel with special competence in records work, increased understanding and support of records work by administrators, and expansion of training facilities specifically designed for public health records personnel are some of the steps needed to improve health department reports and records, Lucas stated.

Records Systems

Each element of a records system must be selected for its contribution to the whole because a breakdown in any one element will affect the functioning of the entire system. According to Lucas, obsolete procedures, lack of attention to schedules for the disposition and retention of records, and delay in the progression of records from point of origin to final filing are some of the problems of records systems.

Lucid, concise, up-to-date procedures manuals are essential to the effective use of record forms, Lucas said. A reviewing body should correlate the forms used by various programs and disciplines in the health department in order to avoid unnecessary multiplication, to assure consistency in format, and to make sure that the size of the forms conforms to that of the filing equipment in the department. Before introducing a new form into a records system, revising or combining existing forms or changing procedures should be considered.

Records Management

Office management implies the planning, organization, and control of office activities but in the health department the activities often control the office, Lucas stated.

Perhaps the greatest handicap to good records work is lack of interest in and support of good office methods and records management on the part of administrators, health officers, and program directors, Lucas asserted. Administrators frequently fail to make it clear to the staff that authority for certain operations has been delegated to the records clerk. They also sometimes allow

inefficient procedures to continue because they do not see the need for change and do not give authority to anyone else to make changes in routine procedures.

Although the records clerk has the principal responsibility for records, each member of the health department staff has some kind of records work to do. In local health departments, where the clerk's multiplicity of duties leaves insufficient time for records work, the burden of handling records falls on nurses and sanitarians, whose training and interests lie in other directions.

Filing is one of the most important areas in a records system, Lucas stated. Also, she pointed out, because of the many sources and types of information about each patient who comes to the attention of a health department, it is one of the areas of greatest confusion. To prevent misfiling and misplacing records, she suggested that one person be delegated to do all filing and refiling.

Lucas recommended unit filing by person, place, or family whenever possible. However, in large health departments, numerical systems have been found to be a satisfactory method. In departments which do not have a large volume of records, alphabetical systems are more practical.

Personnel and Training

Too few clerical personnel and employment of persons with insufficient skill and training in elementary office techniques hamper records work in health departments and make it necessary for other personnel to spend too high a proportion of their time on records, Lucas stated. Public health administrators have little training in the principles and practices of office management; physicians, nurses, and sanitarians are not expected to be competent in this field; and personnel with sufficient training are not attracted by the status or salary of the clerical position offered, she said.

There are practically no formal training courses for public health

records personnel, and inservice training courses provide little appreciation of the importance of integrating records with the work of the entire health department or of the significance of records procedures, Lucas reported.

Training courses for records personnel are urgently needed, she concluded. These courses should include instruction in office management, analysis of office methods, design and control of forms, filing methods and equipment, writing procedures, and coordination and utilization of data, she said.

Laboratory Activities Need Evaluation Aids

Properly prepared evaluation indexes help administrators measure the effectiveness of their programs and help win support for their budget requests, said Dr. Daniel Bergsma, New Jersey State Commissioner of Health.

The most potent evaluation procedure, he suggested, is a well-designed method of recording public health activities; for no program can be efficiently applied or evaluated unless it is recorded.

The evaluation indexes of the chemistry laboratory program of the New Jersey Department of Health covered scope, personnel, methodology, equipment, quarters, location, samples, and records. These indexes, according to Dr. Bergsma, were designed "to emphasize accomplishment rather than effort and to stress quality more than quantity."

Evaluating laboratory procedures, Bergsma said, must be viewed within the context of certain variables: the excess or lack of trained personnel in relation to the job to be done; the availability of adequate tools and facilities; the maintenance of balance between advanced training and new needs; and the preservation of balanced relationships with those who are served.

The criteria of these variables, he pointed out, might become com-

termine present and future needs; (b) organize new facilities or expand existing ones if supply will not meet expected demand; (c) utilize present and contemplated educational facilities to meet State and regional needs; and (d) promote an equitable distribution of dental personnel to serve an equal number of patients.

Nation's Dentist Shortage Estimated at 13,500

The number of dentists in the United States has become progressively *disproportionate* to public needs during the past 27 years, reported Dr. Quentin M. Smith, assistant chief, Division of Dental Resources, Public Health Service.

Within the same period, he added, the public's appreciation of good dental care, and the ability to afford it, have increased substantially.

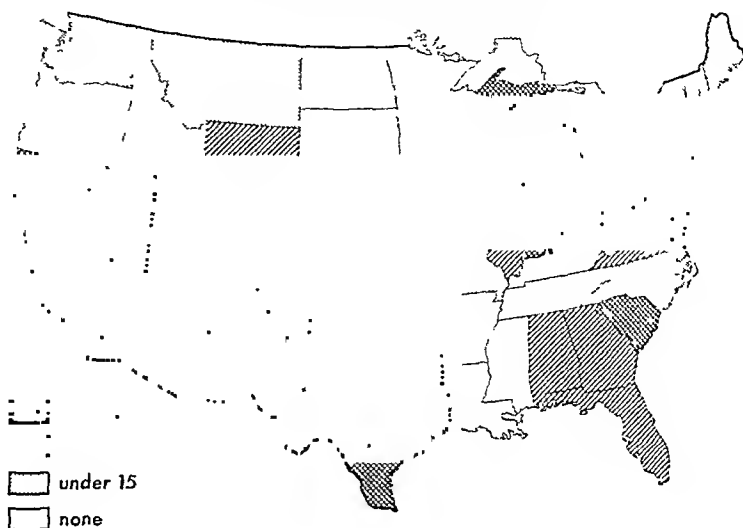
Estimating the current shortage of dentists in the United States at 13,500, with California and States in the Great Lakes and southwest regions showing acute shortages, Smith pointed out a need to expand dental training facilities if the Nation's oral health is to be protected.

Calculating Needs

In 1940, Smith reported, there was a ratio of \$2.2 million of personal income to every dentist; in 1955, there was one dentist to every \$4 million. Thus, "when before the war we had 2 dentists, today we have only 1 in relation to the same amount of purchasing power."

The fact that there is twice as much money available, however, does not necessarily mean that twice as many dentists could be used, Smith said, since competition for the consumer's dollar has increased. For this reason, in order to find a basis for calculating the need for dentists a 1955 average was taken of all States, creating thereby a hypothetical State having one dentist per \$4.3 million personal income. This value,

Percent increase needed in dentist supply to meet demand level of the top 24 States, 1955.



after proper weighting by an index of population characteristics known to affect demand for dentists' services, was taken as representing an average level of "effective demand" for dentists.

An average of the 24 States having the largest number of dentists in relation to income (1 per \$3.6 million), weighted in the same manner, defined a second, more optimum level of effective demand. Using these two values as standards, Smith said dentist requirements at either level of effective demand can be calculated for any State or area for which information on income and population characteristics is available.

Taking into account all factors, "we would need about 6,000 additional dentists to provide every region with a dentist supply big enough to meet the demand level being met in the average State today, and it would take nearly 13,500 additional dentists to meet the demands equivalent to those being met in the top 24 States."

The regions needing the largest numbers of dentists are, in order, Great Lakes, far west, Middle Atlantic, and southwest (see map). In addition, one State located outside these regions—South Carolina—has a particularly urgent need for dentists.

Records and Measurements . . .

Improved Records Systems Seen Crucial Need

More than 40 years ago Dr. Charles V. Chapin of the Public Health Service pointed out that the absence of readily available facts was responsible for the lack of system in public health programs and

procedures. Yet today, reporting and recording systems are still inadequate, according to Nancy W. Lucas, supervisor, records consulting unit, division of vital statistics, Ohio Department of Health, Columbus.

Application of principles and techniques of office methods and records management to public health rec-

nant neoplasms, with special reference to cancer of the respiratory system, diabetes, all cardiovascular-renal diseases, influenza and pneumonia, and cirrhosis of the liver.

A questionnaire was sent to each physician who had signed a death certificate, asking for information on diagnostic methods and findings on which the certification of cause of death was based, an expression of his certainty of the diagnosis, and a revised diagnosis if his opinion had changed since he signed the death certificate. Questionnaires were also sent to the physicians, if any, who had attended the patient before the certifying physician. Coroners and medical examiners were also queried.

An internist directed the review of the questionnaires and original death certificates for type and amount of supporting diagnostic information, consistency between medical certification and diagnostic information, and the physician's expression of his certainty of the diagnosis. Both clinical and pathological information were considered. The reviewer's own impression of the certainty of diagnosis was added to the information obtained from the questionnaires and death certificates.

Diagnostic Information

Apparently most deaths are certified by the general practitioner rather than by the specialist, and, except for deaths from cardiovascular-renal diseases, relatively few deaths from the causes studied are certified by coroners or medical examiners. However, these deaths from cardiovascular-renal diseases can significantly affect the statistics.

The kind and amount of diagnostic information reported as being available to the physician certifying the cause of death varied considerably, from sketchy information in 33 percent of the deaths to good or very good information in 58 percent. The quality of reported information on diagnostic methods was best for malignant neoplasms; diagnostic information was "very good" for 63 percent of deaths from this cause.

For the other diseases studied, quality varied considerably with the cause of death.

The ratings of consistency between the medical certification and the reported diagnostic information indicated that for 79 percent of the deaths, the reported causes of death were the most probable diagnoses. For the medicolegal cases, however, the percentage was only 61 percent. In the 5 percent of deaths for which the certifying physician changed his diagnosis, the reviewer usually agreed with the new diagnosis.

The reviewer's scores of the amount and kind of information reported, the reasonableness of the physician's diagnosis, and the reviewer's own opinion of the accuracy of the diagnosis reported were combined and the diagnoses were grouped into four categories—"solidly established," "reasonable," "in doubt," and "probably wrong." Diagnoses were apparently solidly established in 43 percent of the cases, reasonable in 36 percent, doubtful in 10 percent, and probably wrong in 8 percent. Four percent could not be evaluated because of lack of information.

The proportion of solidly established diagnoses is higher for male than for female decedents and for persons under 75 years of age than for those who are older. The lower quality of diagnostic data in the older age groups may be due to the fact that attempts to make a definite diagnosis would not be helpful to the patient or it may be due to the uncertainty of the certifying physician or the reviewer as to which of several diseases caused the death.

Recommendations

Discussion of the significance of the data available from death certificates in clinical or clinical-pathological conferences of the principal disciplines associated with each case would be helpful in future studies, but this approach would be feasible only for deaths in a single institution. However, interviews by an internist with persons who have some knowledge of the medical as-

pects of the case might supplement the questionnaires.

Future Offers Statisticians Opportunity and Challenge

The statistical phases of nuclear energy programs, epidemiological studies of diseases, and planning and evaluating the resources, needs, and costs of health and medical services offer the statistician outstanding opportunities and great challenges, declared Dr. Ruth R. Puffer, chief, epidemiology and statistics section, Pan American Sanitary Bureau, Washington, D. C.

Health Statistics

In nuclear energy programs, the services of the statistician can be used in measuring radiation exposure and its effect on man, in determining permissible exposure to radiation, and in developing statistical methods for analyzing data on human and experimental population genetics, Puffer stated. Some long-range studies in this field might cover several generations, she said.

Throughout the health field, the statistician assists the epidemiologist and administrator by providing epidemiological data for use in studying diseases and health conditions. According to Puffer, clinical and epidemiological studies of the major causes of disability and death and of cardiovascular diseases, cancer, and mental diseases require that a statistician be a member of the study team.

On a world basis, differences between countries in terminology and classification of causes of death result in tremendous differences in death rates from specific causes and in other data, Puffer said. As an example of the need for understanding medical terminology as used in various languages, she cited the use of the term "toxicosis." In nearly all Spanish-speaking countries, "toxicosis" means a specific clinical entity resulting from severe and rapid dehydration from diarrheal diseases.

pletely subjective unless objective measuring tools can be devised and applied. This does not imply that evaluation teams must be used; he found from his own experience that self-evaluation achieves adequate objectivity without consuming the time of an evaluation team.

There is a need at present, Bergsma concluded, to find proper evaluation indexes to measure both quality and quantity of laboratory activities, and to find means of applying these indexes to State operated laboratories or those working under the approval of the State department of health.

Hospital Records Supply Information to Physicians

Much useful information, some of it of real value to the practicing physician, is available in hospital records, stated Dr. Robert C. Hoffmann, of the J. Hillis Miller Health Center, University of Florida, Gainesville, Fla.

However, although a great deal of information can be extracted from hospital records at reasonable cost by the use of mechanical devices, physicians need training and statistical guidance to enable them to use this information, Hoffmann declared.

Most practicing physicians make little use of hospital records, Hoffmann reported. They complete the records with effort, file them, and, except for clinical use of records of patients admitted to the hospital more than once, seldom use the records again. Perhaps this is because the information in hospital records is not easily accessible and few physicians have enough statistical training to appreciate the value of the information in them, Hoffmann suggested.

Potential Uses of Records

All physicians are interested in information which summarizes their own hospital practice and provides information with which they can compare their own practices and those of their colleagues, Hoffmann

said. Properly summarized records can give the physician a picture of the changes in the prevalence of hospitalization and in the incidence of disease and of the popularity of certain surgical procedures. In this connection, a practicing physician might ask his hospital for a periodic summary on his own patients and for summaries on all patients in the hospital.

The hospital record provides information on current practices and makes it possible to compare these practices with the results of research, Hoffmann pointed out. For example, in a recent study of records of patients hospitalized for coronary disease, it was found that treatment with anticoagulants had been given to only two-thirds of those who probably could have been benefited by this treatment.

Hospital records also make it possible for physicians to acquire information on a new treatment being used by their fellow practitioners. Hoffmann stated. A pool of information such as can be found in hospital records will increase the rapidity with which the effectiveness of the new treatment can be established. Hoffmann recommended that this use of hospital records be expanded. Furthermore, he said, in cooperative studies conducted in two or more hospitals, patients' records can provide data much more rapidly than can a study in a single hospital.

Hoffmann said that, with punch-card equipment and electronic machines for handling data, it is not difficult to abstract information from hospital records. The only limitations are the amount of information in the records and the amount of money spent.

Statistical Training of Physicians

Much more difficult than setting up an abstracting system is the problem of training physicians in the use of the abstracted information, Hoffmann stated. Such information cannot be used to the best advantage because many physicians are unfamiliar with statistical methodology, he said. However, since some

medical schools do not employ a statistician, in his opinion, few physicians can be expected to be familiar with statistical methods.

The responsibility for training physicians in basic statistics lies with statisticians and, as a professional group, they have done little to acquaint the members of other professions with the statistician's functions, Hoffmann stated.

In closing, he expressed concern about the role of the statistician in medicine and reported that a motion to seek joint meetings with medical organizations had been passed at the last meeting of the Eastern North American Region of the Biometric Society. Eventually, he said, a separate medical statistical organization probably should be established.

Study of Death Certificates Shows Diagnostic Difficulties

Complete and unfailing accuracy of antemortem diagnosis is unattainable, and insistence on absolute accuracy in the medical certification of causes of death is unreasonable. However, a study of diagnostic evidence available in support of recorded causes of death in Pennsylvania suggests that diagnostic data on which medical certifications are based are of a relatively high order of quality.

The study was conducted in cooperation with the Pennsylvania Department of Health for the purpose of determining the possibilities of developing measures of the quality of medical certifications of death and to ascertain the problems involved in the conduct of a study of this kind. The results were reported by Dr. Iwao Moriyama, of the National Office of Vital Statistics, and Dr. William S. Baum and William M. Haczszel, of the National Cancer Institute, Public Health Service.

The causes of death included in the study were tuberculosis, malign-

official health agency, or voluntary organization.

They also suggested, in reflection of low frequency reports for eye conditions and emotional disturbances, that visual screening be made part of health appraisal of school children and that physicians in the well-child conferences receive more intensive preservice and inservice training in mental health.

Another question raised was whether well-child conferences should set a definite policy on provision of treatment for skin, respiratory, allergy, nutritional, and gastrointestinal conditions, some of which are already being treated at the conferences. Such a plan, they reasoned, would integrate well-child supervision and treatment, eliminate delay in treatment, and lower the number of visits which a family has to make.

Study of the attendance pattern of the conference could stimulate further surveys, they said, offering a number of possible causes for the less than expected infant attendance and the dropoff after 36 months of age. Another field suggested for study was the preventive aspects of the most frequent mortality causes among postneonatal infants and preschool children—congenital malformation, accidents, and respiratory infections.

Early Prosthetics Stressed For Child Amputees

A prosthetic device applied at an early age becomes as much a part of the child as the shoe he wears, stated Dr. Carleton Dean, director of the Michigan Crippled Children's Commission. Child amputees who are nonwearers, he continued, run the danger of atrophy through disuse, contractures, ankylosis, or ancillary deformities.

Early fitting will lead the congenital and the traumatic amputee to his greatest potential of purposeful movements and motor patterns within the limitations of the prosthesis. For the congenital amputee

to achieve early developmental use, a medical evaluation and recommendation must be made during the first year of life, according to Dean.

Describing briefly Michigan's pioneer venture in child amputee services, Dean said that a preliminary survey of the State's child arm amputees revealed that 7 out of 8 were not wearing their prostheses, mainly because the devices were not functional. The commission then gleaned a register of child amputees from a list of crippled children in Michigan. In addition to determining caseload, this register assured accurate diagnostic evaluation and followup services, he said.

The pattern of the amputee program, as outlined by Dean, begins with examination of the child, evaluation, prescription, and therapy. Prosthesis fitting is followed by training, occupational therapy, and field service and clinical followup. Dean observed that results of training to overcome the physical handicap hinged largely on the degree of enthusiasm of the prosthetic team—orthopedists, therapists, nurses, prosthetists, and instructors. He attributed a large measure of the commission's success to the practice of followup supervision and guidance. Definite clinic appointments at regular intervals are made for the child's return visits, with postcard reminders sent out in advance each time. The reasons underlying broken appointments are investigated.

Dean made clear that child amputees from other States may be referred to the Michigan Area Amputee Center for treatment, by the appropriate official agency when such services are unavailable in the home State. The commission has received Federal funds to finance treatment of out-of-State child amputees.

Every State or area with a population of more than 2 million should have a child amputee center, but not more than one for each million persons, he said, since an insufficient number of patients will weaken the interest of the amputee team. He advised that such a center be set up in a city with a hospital or rehabili-

tation institution having such specialists as a pediatrician, internist, plastic surgeon, urologist, a physical and an occupational therapist, and a medical social worker. The limb shop would ideally be in or near the hospital and directed by a certified prosthetist.

Dean mentioned available courses for prosthetists at the University of California at Los Angeles and at New York University. For study of the management of child amputees, he announced that orthopedic surgeons and physical and occupational therapists may enroll in courses at the Michigan Area Amputee Center in Grand Rapids.

Breast Feeding Variations Reported in New York

The practice of breast feeding of infants is more common among higher than lower socioeconomic groups, according to a survey of 1,433 upstate New York mothers who had given birth under normal conditions 3 to 6 months before.

The project, which studied variations in childbearing and child-rearing health practices according to social class, was reported by Dr. Alfred Yankauer, director, bureau of maternal and child health, New York State Department of Health, Dr. Walter E. Boek, research anthropologist of the same department, and Dr. Edwin D. Lawson, assistant professor of psychology, State University of New York College for Teachers, Albany, N. Y.

Interviews were carried out by 490 specially trained college students in social science and nursing in 15 widely scattered rural areas, villages, and cities near the participating schools. Although the selected sample represented from 1 to 36 percent of the number of annual births in these areas, it was by chance similar in many ways to the universe of families having births in upstate New York. The authors pointed out, however, that representation from central cities was heavy and suburban areas were unrepresented.

The International List of Diseases and Causes of Death assigns toxico-sis in children under 1 year of age to "ill-defined diseases peculiar to early infancy." In Chile, assigning toxico-sis to "diseases of early infancy" has resulted in high death rates from these diseases and low death rates from diarrheal diseases in infancy, Puffer stated.

Health Services

Puffer said that definitions and standards are needed in planning health and medical services and that the experience of statisticians concerned with morbidity studies, prepayment insurance programs, hospital statistics, and other phases of medical services is valuable in establishing national and international standards. She stressed the importance of the development of comparable statistical data on a world basis so that comparisons can be made of data in areas with varying environmental conditions.

Quality Control Urged For Mortality Data

Before mortality data can be accurately used for epidemiological research, a means of measuring the biases of the data must be developed, according to Dr. Tom Donnelly, School of Public Health, University of North Carolina.

"Epidemiology," he said, "has reached the state where the analytical tools it uses are more powerful than the accuracy of its raw data would warrant, at least when these raw data come from published vital statistics."

Donnelly, pointing up analytical difficulties involved with mortality data on heart disease, said that almost all measurable social factors are associated with heart disease. But no single measurement can describe the separate effect of any factor because each factor interacts in its own particular way with the others. With so many factors operating, it is possible to "prove" any-

thing, Donnelly said, merely by selecting some factors and ignoring others.

Conclusions derived in this manner contain what might be called analytical biases. More basic, Donnelly said, are the statistical biases inherent in the mortality data. Biases or errors may occur from an improper classification of a disease resulting in under- or over-estimation of mortality, or they may occur from additions to or omissions from the bookkeeping system after the patient has died. In either case, no quality control system exists, Don-

nelly said, which can determine the magnitude of biases or errors in mortality data.

Donnelly urged that steps be taken to measure this magnitude. As the initial step, he suggested listing procedural aspects of collecting vital statistics that are subject to biases or errors, so that the cost of either measuring accurately or reducing errors and biases may be assessed.

It is not necessary, he emphasized, to eliminate biases; one need only measure them. Once they are measured, the statistician will be able to do accurate factorial analyses.

Maternal and Child Health . . .

Recommend Screening Child For Eye and Mental Health

Among 950 presumably well infants and preschool children examined in Minneapolis well-child conferences of 1957, about 37 percent were found to have at least one health problem, according to a study reported by Dr. Helen M. Wallace, Dr. Evelyn Hartman, Vernon Weckworth, and Dr. Eunice Davis of the University of Minnesota School of Public Health and the Minneapolis Health Department.

Studied by the University of Minnesota School of Public Health and the Minneapolis Health Department in April, and again through June and July, the conferences showed that the highest frequency of health problems occurred in children 49 to 60 months of age, in nonwhites, and in boys. In general, infants and younger preschool children had a lower frequency than the older preschool group.

The authors also found that 29 percent of the children had 1 health problem, 6.7 percent had 2, and 0.6 percent had 3. The most common conditions identified were skin and respiratory, with cardiovascular, orthopedic, genitourinary, allergy,

and nutritional problems appearing next in frequency; followed by eye, gastrointestinal, and ear conditions. Low percentages were reported for both dental and emotional irregularities, which the authors attributed to possible lack of interest of examining physicians. Individual conditions occurring most frequently were respiratory infection, diaper rash and other skin disturbances, and umbilical hernia.

Eight percent of the children had had an accident since the last visit, the greatest frequency occurring in age groups 13 to 20 months and 25 to 36 months, and among whites. Falls caused 69 percent of the mishaps, and burns and ingestion, 10.7 and 4.8, respectively.

Translating these data into indexes of community needs, the authors recommended that, for such common health conditions in infants and preschool children as cardiovascular, orthopedic, genitourinary, eye, and ear problems, diagnostic and treatment specialty services be set up. They added that the group responsible for child health supervision must accept some responsibility for spurring development of these services, whether in the official crippled children's agency, teaching hospital,

offers considerable guidance in teaching how to organize a school health program, he said. Many practical points emerge, for example, in the cooperative planning that helps the school complement, rather than interfere with, the family-physician relationship. By participating in such planning, Lichty noted, future physicians can learn while they perform a local service. Denver physicians in charge of school health present cases at the medical school each year.

To show the effectiveness of routine active immunization of children, the university pediatrics department compares the morbidity and mortality statistics on diphtheria and pertussis of the State before and after such immunization. Among other teaching material, Lichty mentioned a study showing the need for more cooperation of physicians and parents in immunizing infants, a study of heart disease in Colorado's sixth-grade school children, and another of the State's mortality from appendicitis.

According to Lichty, a prime teaching benefit derives from Colorado's premature infant service. The department sends premature infants directly to the university hospital and pays for a large part of their care.

Health department personnel are in constant touch with developments in the supervision of the newborn nursery of the university hospital, a contact reflected in the department's official plans and rules for nursery operations. Routine inspections of community hospitals are rather guidance sessions than "police actions," he said. Often, department officials suggest that medical school professors give short refresher courses in community hospitals to clear up trouble spots.

Lichty believes that leaders of State and county medical societies are more prone to approve public health suggestions that have the support of a responsible university faculty member.

Any public health activity for children can benefit from this dual

function, Lichty said, adding that the consultant himself, through constant intellectual bombardment, derives the greatest personal benefit.

Custom-Made Plans Urged For Developing Areas

"Only the scientific principles of Western public health practice are universally applicable, not program patterns," stated Dr. Jessie M. Bierman of the School of Public Health, University of California, in a review of World Health Organization-United Nations Children's Fund activities in maternal and child health in developing countries. Prefabricated Western-type programs need reorienting toward local needs and resources, she said.

Epidemiological methods from the West, however, as well as the problem-centered approach can be transferred to these areas. In this connection, Bierman emphasized the need for more local morbidity and mortality data and for studies of the growth and development patterns of children, feeding practices, and beliefs and traditions concerning childbearing and child rearing. She also recommended study of the influence of socioeconomic and cultural factors

on the patterns of disease and on the workability of health measures, noting that most health problems in underdeveloped areas stem, rather than from exotic tropical diseases, from inadequate sewerage systems, squalid, overcrowded housing, and contaminated, meager water supplies.

The scope of maternal and child health programs needs broadening, she said, to embrace general health needs of mothers as well as special needs centering on reproductive and growth processes.

Bierman took issue with the current concentration of child services on the neonate at the expense of the older infant and young child, since major health problems in developing areas—undernutrition, malnutrition, and intestinal infections—begin during weaning and continue through the second and third years of life. She pointed out that some countries report about as many early childhood deaths as infant deaths.

During 1947-56, Bierman said, 601 WHO fellowships enabled maternal and child health workers to pursue training abroad, and through UNICEF-WHO assistance, governments set up, extended, or improved their personnel training facilities. She reported good progress in general in training personnel and in the extension of minimal services.

Manpower . . .

Health Manpower Challenge Tackled on Broad Front

Manpower for health work hinges most of all on how realistically the health profession meets the challenge of competition for labor in the face of a limited supply of skilled young workers, said Dr. Leonard A. Scheele, former Surgeon General of the Public Health Service, speaking as chairman of the Commission on Health Careers, National Health Council.

The commission was organized recently as an outgrowth of the Health Careers Project of the council, launched to support career development and recruitment for the profession.

Reviewing some of the accomplishments of the Health Careers Project, Scheele mentioned that it has highlighted the gaps in information on health manpower needs and in the health profession's plans to meet competition for labor. The project has also shown that such competition means more than recruitment, that

For classifying into social groups, the Warner Index of Social Characteristics was used together with photographic guides to characterization of house type and dwelling area. The index, they explained, is based on the sum of scores for occupation, income source, house type, and dwelling area, weighted in the order given.

Other survey results mentioned were:

- One mother out of every three worked during her most recent pregnancy, with roughly the same distribution in each class.

- Among mothers in social class V (lowest), 26 percent had not sought postnatal care at the time of the interview, compared with 13 percent for all mothers.

- One out of four mothers had ever undertaken breast feeding. It was most popular and was continued longest by social class I and II mothers, while the reverse was true of those in social class V.

They urged health authorities to consider drawing on the interest and manpower of college and university social science departments, pointing to the mutual benefits of experience and data from their projects.

Such a survey can measure the extent to which observed health practices meet generally recommended standards, they stated, adding that social class groupings may pinpoint one class as a program target, as in this study, in the question of postnatal care, and the distribution of specialist services.

Since the survey can be duplicated later, it can be used to evaluate the effectiveness of a public health program and measure progress in health practices, both generally and by class. A further suggestion was that, through this technique, health departments expand their function of morbidity and mortality reporting to include health practices and knowledge. Probing desired and expected health services of the community was another recommendation.

The authors concluded with the thought that measurements them-

selves have unpredictable values. Therefore, possible shifts in such factors as social class patterns of breast feeding of infants may have more meaning 10 years hence.

Navajo Child Health Level Mirrors Tribe Future

On the principle that the health of the school child is the key to the general health level of the community, Dr. John C. Cobb, of the Division of Indian Health, Public Health Service, Albuquerque, N. Mex., says that one may determine the design of public health activities and forecast the lines of tribal social and economic growth among the Navajos.

Health Record

Infant mortality is about 99 per 1,000 live births among the Navajos, a tribe of more than 80,000, living in widely scattered, small and crowded hogans. This rate, said Cobb, mirrors the fact that, for many Navajo mothers in labor, reaching the hospital means a wagon trip over more than 50 miles of sandtrack.

More than a third of Navajo school children so far examined have signs of active or healed trachoma. About a third are tuberculin positive on school entrance, one-half testing positive by age 16. The tuberculosis case rate is more than 600 per 100,000 population, Cobb remarked. Between 5 and 10 percent of the school children have chronic draining otitis media or perforated eardrums, with partial deafness. School children compose one-third of the total Navajo population.

As a background for this health record, Cobb recalled that the Navajos have contended with limited resources on the reservation, drought, a ban on sheep grazing to stem erosion, and lack of water, combined with a tenfold growth in population in less than 90 years.

School Child Health Index

Those planning public health activities for the Navajo tribe face

the challenge of doubtful statistics, Cobb said. Cultural taboos against mention of death, for example, and recording in overcrowded clinics hinder accurate reporting. Statistics for the large school population, on the other hand, are readily accessible. Cobb proposed setting up an index of the percentage of children in a selected grade who are in good health. This, in effect, is a yardstick for measuring the end results of maternal and child health programs. He then submitted a list of conditions tentatively defining the child's good health.

Cobb believes that, in addition to local uses for the index, it can be used to compare the health of school children in various parts of the world and can pinpoint the targets for technical assistance in public health.

Pediatric Professor's Own Mutual Aid Program

The advantages of having an associate professor of pediatrics serve as pediatric consultant in a State health agency were described by Dr. John A. Lichty of the University of Colorado Medical School, who has received such an assignment with the Colorado State Department of Public Health.

University pediatric departments, Lichty said, can consider public health questions in hospital nurseries, communities, or in the entire State to be like individual clinical cases in the instruction of medical students. As in clinical medicine, he pointed out, the use of actual cases sharpens the effect of teaching.

Illustrating the public or community case, Lichty cited results of a neonatal mortality study in Colorado. The survey effectively demonstrated to the students the importance of improving care of the newborn and provided substance for discussions of possible factors in neonatal mortality.

Experience in a health department, in contrast to pediatric textbooks,

planning to practice their profession, rather than go into research or teaching, is limited.

The Public Health Service, which among the Federal agencies has the major concern for sanitary engineering and related professional personnel, offers the following educational support in this field:

1. Research fellowships authorized by title III of the Public Health Service Act of 1944 were extended to sanitary engineering in 1957. They are aimed at increasing the number of engineers and scientists qualified to conduct independent research in problems of environmental sanitation.

2. Traineeships awarded under title I of the Health Amendments Act of 1956 are available to sanitary engineers, sanitarians, sanitary chemists, and allied personnel. These are intended primarily to bring new people into public health and thus give preference to persons who are under 35 years of age and who have had no more than 2 years' experience in public health and less than 1 year of graduate or specialized public health training.

3. Training grants-in-aid for study in air pollution control originate under the Air Pollution Research and Technical Assistance Act of 1955. Recipients are of three types: individuals, State and local government agencies, and educational and training institutions.

Recommendations of the Conference on the Education, Training, and Utilization of Sanitary Engineers held in the spring of 1957 indicate recognition of the need for increased financial aid, according to Butrico. This conference, he reported, recommended (a) that graduate fellowships and traineeships be expanded and that they carry no restrictions on the duration of training award to any qualified individual including the doctoral candidate and (b) that financial assistance be extended to undergraduate education of engineers and that a monthly stipend of not less than \$100 plus allowance for tuition and books be provided.

Butrico gave the following reasons for his contention that "much more assistance" for graduate students interested in environmental health is necessary: increasingly complex public health problems; general up-grading of health activities; the expectation that broad education will precede specialization; the need for increased competence in all sanitation personnel, including the sanitarian; the need for an "impressive battery of specialists trained in disciplines not necessarily a part of engineering," such as biologists, physicists, chemists, bacteriologists, and meteorologists; and the low starting and maximum salaries for an engineer in public service in comparison with those in industry.

Considering the question of financial assistance for higher education in general, Butrico observed that only 556 of the 58,000 students applying to the National Merit Scholarship Corporation in the first year of its operation (1955-56) received scholarships.

He also pointed out that a study by C. C. Cole, Jr., sponsored by the National Science Foundation, reported that insufficient financial resources appear to be the sole or primary reason why 60,000 to 100,000 persons of superior ability fail to enroll in colleges each year. The Educational Testing Service, he added, has estimated that some 150,000 high-ability students would have gone to college had adequate financial support been offered them.

Measures Nursing Needs Outside Hospitals

A new method of estimating the number of nurses needed by a community was described by Janice E. Mickey, associate professor of public health practice (nursing), Graduate School of Public Health, University of Pittsburgh. A study is being made of the basic nursing needs of the general population of Butler County, Pa., in order to determine how many public health nurses,

school nurses, and occupational health nurses are needed in the county.

The Study Sample

Families selected at random are interviewed by a nurse, who decides whether the family has health problems that might be helped by the services of a public health nurse, Mickey stated. The sample studied is large enough for generalizations to be made from the data and for an estimate of the extrahospital nursing needs of the population of the county.

To check the reliability of the estimate and to determine whether the single interview misses important problems that can be discovered only with intensive home care, county health department nurses give nursing care to all families considered by the interviewer to need such care, and certain families who were judged by the interviewer not to need nursing care are referred to the health department, Mickey said.

It is thought that referrals to the health department are influenced by the nurse's background and her concept of public health nursing. However, a check of estimates of need for nursing care by two nurses visiting the same 20 families showed a gratifying consistency in results of interviews, Mickey reported. Estimates of the need for care were more consistent than measurement of the family's ability to cope with a situation, she said.

The sampling process is complex and it is often difficult to locate and reach the households, Mickey stated. Interviews vary in length from 35 minutes to 2 hours, averaging an hour and 10 minutes. Nurses average a little over 1½ completed schedules per day in the early part of the study.

To see how effective the nursing service has been, a subsample of families is interviewed a second time. Families referred to the health department are reinterviewed after the public health nurse has closed the case; families receiving nursing care are reinterviewed at the end of 3 months.

facilities, teachers, and earning opportunities may affect the interest of youth in health careers, and that such questions need study. Scheele also gave the project credit for opening the door to new and effective allies and, above all, for demonstrating that effective action must come from nongovernmental sources.

Scheele described the commission's five-pronged range of interest:

- The current and expected supply and shortages of health personnel; as well as the possibility of tapping other manpower sources.
- Utilization of personnel, including assessment of the health field's competitive position in recruitment.
- Job satisfaction, which includes earnings, fringe benefits, and opportunities for advancement, emphasizing solid facts rather than assumptions.
- Education and training for occupations in health, considering the impact of the school shortage on professional education; as well as new types of training for supporting occupations.
- Recruiting, with emphasis on evaluation of new methods and materials in communication techniques.

Scheele said that the most urgent questions which are open to prompt but lasting solution will be identified chiefly through factfinding and research, drawing on all accessible sources of information. In turn, the facts will be made available to all professional and voluntary associations, operating agencies, and educational institutions, to bolster their efforts in staffing health services.

He underscored the fact that the commission will take direct action, through the mediums of public information and education, to underpin efforts in training the Nation's youth in health fields.

Trained Records Personnel Major Necessity

Qualified workers are a first requirement of health department

record systems today, and only specialized training will provide such personnel, declared Alpha K. Kenny, formerly consultant in records training, Communicable Disease Center, Public Health Service, Atlanta, Ga.

Records, the mirrors of services, should reflect today's ideas, methods, and devices, Kenny stated. To accomplish this, trained supervisors are needed to manage records departments and to train staffs, she said.

The Public Health Conference on Records and Statistics, sponsored by the Public Health Service and the Association of State and Territorial Health Officers, has focused attention on the need for improvement in public health records and their management, Kenny stated. In addition, the nursing section of the Southern Branch, American Public Health Association, has promoted interest in records among nursing schools and field teaching agencies in the southern States, and the National Health Council, through its Health Careers Guidebook, has stimulated the interest of college students in public health records.

Training Opportunities

In 1953 the department of field training, University of North Carolina School of Public Health, the W. K. Kellogg Foundation, and the Public Health Service sponsored a working conference on the training of public health records personnel. In April 1957 the University of North Carolina School of Public Health and the Training Branch of the Communicable Disease Center, Public Health Service, offered a 2-week course on management of public health records. Twenty-six record analysts from 13 States and 6 Public Health Service units attended this course at Chapel Hill, N. C., Kenny reported.

A number of States offer opportunities for training to local public health records workers, and other States are planning similar courses, Kenny stated. The departments of health administration in two schools

of public health have held seminars on records management, and forms design has been included in their courses in public health statistics, she said.

Future Training Needs

Employers and merit systems have a joint responsibility for encouraging and helping employees to qualify for the more advanced positions in records management, Kenny asserted. She recommended that merit system authorities set up positions that will attract and hold competent people and that employees in the lower classifications be given inservice training that will qualify them for more advanced positions.

More than inservice training, short courses, institutes, and workshops is needed, however, to prepare personnel for advanced positions in public health records management, Kenny said. She suggested that undergraduate work in public health administration include courses in records management, and that graduate work be provided for students who can qualify for such programs.

Field demonstrations of public health records systems would be a helpful supplement to formal academic courses, Kenny concluded. Held in strategic locations, they would give students an opportunity to see records systems in actual use, she said.

Increased Financial Support Urged for Health Training

A plea for increased financial assistance for training in environmental health was voiced by Frank A. Butrico, chief of the Engineering Resonances Program, Public Health Service.

Reviewing current grant and traineeship offerings, both inside and outside the Federal Government, he observed two major deficiencies: there is virtually no undergraduate assistance specifically for persons interested in a public health career; assistance for graduate students

as "Golden Age" or "Senior Citizens" clubs, Kutner said. It is in such clubs as these that they may learn about their specialized needs and how to meet them.

Kutner warned against mere exhortation as inducement to people to take action and said that, if exhortation is to succeed, the situation must be made meaningful to the individual, centering specifically on his personal situation.

Program Elements

As to the elements of a successful program for senior citizens, Kutner said:

1. Make the programs specific and thereby induce groups of older people to establish regular health habits. In groups, there is a tendency for each person to be influenced by the desires and wishes of the others.

2. Bring groups of older persons to various centers to see for themselves.

3. Keep the older person apprised of health education activities (radio and television programs, books, pamphlets, speakers).

4. Establish an up-to-date directory of health services available to older persons and provide at least one responsible individual who can make appropriate referrals to a health agency.

5. Make mental health an integral part of the program. The very programs the center creates are themselves aspects of the mental health education program.

Current Techniques

Kutner gave examples of programs throughout the country in illustration of techniques currently in practice.

The Marin County (Calif.) Senior Association purchases and prepares gifts to be distributed at hospitals by Red Cross Gray Ladies.

The New Hampshire Golden Agers assist the mental hygiene and child guidance clinic by sending birthday cards and letters to children under the care of the clinic.

The Amalgamated Clothing Workers of America, with one center in Philadelphia and one in New York, stresses the relationship between leisure-time activities, social adjustment, and the maintenance of health.

The Akron (Ohio) Golden Age Club prepares, for the General Hospital, medical records for microfilming or for mailing.

Senior Achievement Incorporated (Chicago) employs about 25 workers in the production of such items as wooden footstools, cradles, and sandals as well as in clerical and drafting jobs.

Meaningful Activities

Government and voluntary agencies have programs based upon the concept that physical well-being and sound mental health are enhanced by activities which offer an oppor-

tunity to the individual to contribute in some meaningful way to the community at large or which provides sources of additional income. He mentioned the Minnesota Department of Health, the Sirovich Center (New York City), the Ithaca (N. Y.) Senior Citizens' Center, the Women's Education and Industrial Union (Boston), and the Sunset Industries (Bangor, Maine), as outstanding examples.

In conclusion, Kutner pointed to the Pasadena-Alhambra Committee on Aging, the Greater Muskegon Geriatric Council, and other agencies both public and private. These centers are training leaders for dealing with the aged. Such programs of leadership training and activities for the aged, and the wealth of health education materials indicate the scale on which the efforts for the aging are progressing.

Medical Care . . .

Home Care Programs Extend Hospital Care

The establishment of home care programs by general hospitals and use of the facilities of these programs by physicians for their private patients is proving to be a major and highly desirable development in medical practice.

This belief was expressed by Dr. Peter Rogatz, associate director, division of professional services, Health Insurance Plan of Greater New York, and Guido M. Crocetti, acting director of research and planning, New York City Community Mental Health Board, in their discussion of the impact of home care programs on the place of the hospital in medical care.

Service to the Community

New concepts of medical services to be provided by hospitals include home care programs which use teams of physicians and other professional

personnel to care for homebound patients who do not require hospitalization but who cannot be cared for in outpatient clinics. The growth of these programs is an indication of the hospital's development as the center of community health and medical services.

Most home care programs provide medical care to medically indigent or indigent patients by hospital residents, other salaried physicians, or practitioners in the community who devote only part of their time to the home care program. However, home care can be extended to self-supporting patients of private physicians without interfering with their professional and financial relationships, and provision of services to these patients will reduce the need for subsidizing home care programs.

Home care is a qualitative addition to community health services rather than a means of saving money or hospital beds. Caring for patients at home does not release an equivalent

The Interview Schedule

The interview schedule includes questions designed to obtain data on needs for bedside nursing care and treatment for acute and long-term illness, prehospital and post-hospital care, rehabilitation, and diagnostic services, as well as data on practice, skills, knowledge, and attitudes in relation to home care of the sick and ability to recognize illness, family health practices, and family health protection, including periodic health appraisal and immunizations.

The schedule was tested on a group of families with various health prob-

lems, and after analysis of the findings and some revision of the schedule, it was set up for coding. Although a small part must be completed by a coder, the schedule is for the most part self-coding.

The cooperation of the families interviewed has been excellent, and the entire community has supported the study, Mickey reported. The health department assisted with the basic plans; the board of health made it possible to obtain the approval of the medical society; and newspapers and radio stations paved the way for the interviewers who went into the homes.

The annual report of his department was first presented over station WHO-TV, Tuesday, February 1, 1955, from 1:30 to 2:00 p. m. In telling the group how to do it, he said, "First consider what you wish to accomplish."

Each section of the department submits monthly records from which annual reports are compiled.

To communicate the health department story, the program utilized role playing, problem-solving situations, conferences, cartoons, photographs, demonstrations, and charts. Christensen rewrote the material and fitted it to the allotted 30 minutes. Each section rehearsed its portion of the script separately. The entire department cast (15 members) rehearsed twice prior to the dry run at the TV station.

The telecast, besides department personnel, consisted of the chairman of the board of health, the city manager, the executive secretary of the Council of Social Agencies, and 14 others, including a mother and baby. In answer to the request for permission to televise the next year's report, the station manager asserted, "On one condition: It must be at least half as good as last year's report."

Education . . .

Communication's "Why?" Is All Important

Each health organization must improve its internal communications before it can expect to communicate successfully with its clients in the community, stated Chester S. Bowers, director of the bureau of public health education, Connecticut State Department of Health.

Bowers defined internal communication as "meaning and including all workers within an organization," and not exclusively professional and quasi-professional personnel. Communication even within a single organization, he said, is not substantially unlike problems, and ways to their solution, met in health education of the public.

Communication's "Why?" is more important than its "How?" Bowers said. He put the chief emphasis on persons concerned rather than on the medium or the material. The expert should be on tap and not on top, he told his listeners. No one, not even an expert, can give appropriate answers until given the questions. A symbol for effective communication may be thought of as a roundtable at which people are relating themselves to each other, he said. In

a network of mutuality, the lines of communication are down less frequently, and the messages are less likely to be misheard or misread.

He said, "The administrator or the officer and field practitioner within an organization today who looks upon communication simply as a matter of issuing a directive or statement of information is open to disappointment in the response elicited. Quite frequently these are the same individuals who fail to achieve the results they expect from health education programs they administer or at which they practice. Conversely, the administrator and practitioner with habitual willingness to permit careful and considered observation of each situation . . . is the more likely to gain the response and objective anticipated."

Annual Reports Recipe: Televising Them

The values of presenting a health department report through television were extolled by Sophus R. Christensen, director of public health education, Des Moines-Polk County Department of Public Health.

Golden Age Clubs Educate For Healthful Living

Some older people of their own accord obtain information and engage in activities which help them maintain health. For such people, Dr. Bernard Kutner, of the Albert Einstein College of Medicine, thinks special education programs are largely unnecessary. For others, they are highly necessary.

Although many physicians do not regard geriatric problems as a "specialty," they recognize the need to give specialized attention to the health problems of the aged.

An increasingly large number of people are enrolling in programs of adult education, recreation, leisure-time classes, and in clubs referred to

Disadvantages

With their offices at the hospital, physicians lose some fees because they no longer perform minor laboratory tests in the office, Rorem stated. Some hospital staff members who do not have offices at the hospital feel that the physicians who do have offices there are more likely to be called to treat staff service cases in an emergency. And relatives of hospital patients sometimes pay time-consuming visits to their physician to discuss members of their families.

Rorem pointed out that patients will go any distance for inpatient hospital service but they feel that their physician's office should be conveniently located, and if it is not they may not make office visits regularly.

Costs of renovation or construction and difficulties in assigning space when there are more staff members than offices have sometimes deterred hospitals from establishing private office facilities, Rorem stated.

In conclusion, Rorem said that locating physicians' offices in or adjacent to hospitals is an effective use of capital and coordinates professional services. The potential public health value of such an arrangement is great, and it will probably be more fully realized in the future.

Government Must Study Medical Care Needs

The chief need of health agencies is to learn more about the quality and comprehensiveness of medical care, including how patients seek care, reasons for discontinuation and overlapping of services, what services people want, and the reaction of patients to the care they receive, in the judgment of Dr. Leona Baumgartner, commissioner of health, New York City, and Margaret Klem, medical economist, Public Health Service.

With the rapid growth of voluntary health insurance, the development of inplant health units or union health centers in industrial areas,

the increase in services offered by medical societies, fraternal organizations, and some religious groups, and the expansion of agencies dealing with specific diseases, the public is becoming increasingly interested in both preventive and curative health services and is demanding more and better medical care, they said.

Although cost is a factor in a patient's decision to seek medical care, his cultural background, his education, and his own or his neighbor's experience may be as important influences on his knowledge and attitudes toward medical care as is his economic status, they believe.

However, regardless of how the cost is met, no comprehensive picture of the use of health and medical care services is possible without knowledge of the kinds and sources of professional care received, they assert. It is equally important, they add, to know, for example, the relationships among agencies, between agencies and physicians, and between the patient and each person or agency who provides medical care, in order to determine what relationships are desirable and what should and can be done to improve existing relationships.

A study of health and medical care services by the New York City Health Department seeks to discover the kinds of medical services families receive from voluntary health insurance agencies, to find out why patients go from one source of medical care to another and what pattern of change they follow, and to ascertain their reactions to the care received. These data may also reveal gaps or duplications in services provided by various agencies.

It is hoped by Baumgartner and Klem that this study will reveal factors that either impede or promote effective use of health services and ways in which the administration of medical care services can be geared to community needs and demands. The results may indicate the need for a continuing program that will keep practicing physicians informed of both existing and new

activities and of the extent to which various health agencies serve as case-finding agencies as well as co-ordinators of medical services.

The study, they feel, is sure to point out certain ways of improving specific local health services. It is an example of one of many kinds of studies they believe are fundamental to a better understanding of problems of providing medical care in this country.

Joint studies by health personnel and social scientists and the efforts of public health departments, medical groups, and universities are needed, they say, if health and medical care services are to be the best that medicine can offer.

Windsor's Medical Plan Termed a Success

About 85 percent of the residents of Windsor, Canada, participate in Windsor Medical Service, a voluntary, comprehensive prepayment plan which provides medical services at home or in the physician's office, and surgical, obstetrical, and special services, X-ray and laboratory services, and hospital care to its subscribers on a fee-for-service basis.

The results of a 3-year study of the Windsor Medical Service plan were reported by Benjamin J. Darsky, Dr. Nathan Sinai, and Dr. Solomon Axelrod, of the bureau of public health economics, School of Public Health, University of Michigan, Ann Arbor. Their investigation of Windsor's 20-year experience with the plan indicated that comprehensive physician's care insurance is needed, is not used unreasonably, and is paid for willingly in that city. Results of the study also suggested that the reasons usually given for limiting physicians' services in prepayment plans are not valid.

Principal Issues

Because the cost of individual home or office visits is usually modest, it has been said that insurance should cover only surgery or hospitalized illness. Although most in-

number of hospital beds but it does take care of long-term patients who could not be given hospital care for extended periods.

Personnel

Experience in the home care of patients should be part of the training of medical, nursing, and social work students. Such experience should prepare them to understand and cope with the social and economic aspects of illness and should increase their appreciation of the hospital as a community agency. This understanding and appreciation will be reflected in their future attitude as practicing physicians, nurses, or social workers.

Employment of full-time physicians in home care programs has not proved satisfactory since most programs cannot offer salaries that will attract competent physicians. Employment of practicing physicians part time, either on a salary or fee-for-service basis, is more apt to attract well-trained practitioners.

Physicians who have served in the program will be influenced in their future interests and skills, and representatives serving on the board of directors of voluntary nursing agencies will be enabled to use the agency's home care experience in policy making.

Because of the widespread shortage of nurses and the experience of nursing agencies in providing home nursing service, home care programs usually use the services of existing nursing agencies. However, the quality of nursing care received by the patients will be directly affected by the skills of the physicians and the policies and procedures of the home care program.

Physicians' Private Offices In Hospitals Increasing

Medical staffs and hospitals are being brought into closer relationship through the establishment of private offices in hospitals or in connecting buildings, reported Dr. C.

Rufus Rorem, executive director of the Hospital Council of Philadelphia. The council, through a grant from the Public Health Service, is making a study of private office practice at institutions where physicians are carrying on individual practices, Rorem said.

Most of these facilities for physicians' private offices are owned by the hospitals, Rorem stated. Rents are comparable to those in other office buildings in the community. Occupancy is usually limited to active members of the hospital staff, with priority based on rank or length of service. Physicians occupy contiguous offices, share certain overhead expenses, and are available to each other for consultation and for referring of private patients.

Some income-sharing groups of physicians have rented space in hospital office facilities, Rorem said, but the development of such facilities apparently has not of itself inspired the formation of groups for private medical practice. However, it has acquainted many physicians with the advantages of practicing close to other physicians and of the accessibility of the equipment of a modern hospital.

The principal reasons for establishing physicians' offices at hospitals have been convenience, saving of time, and increased use of hospitals, Rorem said. Other reasons have been change of hospital location and changes in zoning laws.

Legal Considerations

Physicians' private offices are considered to be private business activities of the hospital and the capital investment has been subjected to real estate taxes in some jurisdictions, but the income received from them has not been subject to Federal income tax, Rorem stated. Use of endowment funds for the construction of office facilities at hospitals is legal, provided that the income is comparable to the income that could be expected from other investments, he said.

Government tax funds have not

been used directly for the construction of office facilities at hospitals, although some "Hill-Burton" hospitals have included such offices. Local banks have loaned funds for this purpose, according to Rorem. No public campaigns for funds for office facilities have been held as far as he knows.

Advantages

Physicians who maintain offices at hospitals agree that this arrangement enables them to practice better medicine with less expenditure of time and energy, to have more personal contact with inpatients, and to make hospital rounds more often, Rorem said. Other advantages are the saving of transportation time between office and hospital, the ease of referring patients to fellow staff members, and the fact that in an emergency hospital patients can be seen without major interference with office appointments. One physician reported that he orders private-duty nurses less frequently since he is easily accessible in an emergency, Rorem reported. Hospital diagnostic facilities are easily available, and patients who become used to visiting the hospital for office calls are less resistant to hospitalization, physicians find.

Patients find that the physician who maintains his office at the hospital is usually in or easily available, and office appointments are not canceled because of hospital emergencies, Rorem stated. They also find it convenient to consult other hospital staff members to whom they are referred and to visit hospital departments for diagnostic and treatment services.

In the opinion of hospital trustees and administrators, location of physicians' offices at hospitals has resulted in a feeling of unity between the institution and the medical staff, Rorem reported. Physicians learn about hospital costs, can observe the critical phases of recovery of their patients, and become familiar with the duties performed by other members of the hospital staff.

Efforts have been made to attract physicians to rural areas, but none have been really successful, he said.

In Latin-American countries, state-financed public health services are responsible for health services to the entire population, Bravo stated. Local health units give preventive services to individuals, but the need for curative treatment is so pressing that these local units are devoting more and more time to this service, he said. Maternal, child, and school health services are part of the local health activities. Government-sponsored hospitals and clinics give free care to the medically indigent as well as to paying patients.

All Latin-American countries provide sickness insurance which gives varying amounts of care to ambulatory patients, Bravo reported. This insurance is usually compulsory for industrial workers and, in some countries, for all workers and employees. Coverage is now being offered to new groups of workers and to families.

Chile's National Health Service

In Chile, the National Health Service administers the majority of health agencies. This service is responsible for public health and medical care activities for 70 to 75 percent of the population, Bravo stated. Other organizations provide medical care to civil servants and white-collar employees, the military forces, the police force, prisoners, and railway employees, and an Accident Insurance Fund has its own medical services. Together, these organizations provide medical care to about 90 percent of the population of Chile, Bravo said, leaving only a very small group which finances its own medical care.

The three organizational principles of Chile's National Health Service have been centralization of directives and technical standards and decentralization of the operation of programs, integration of public health and medical care services, and participation of local communities in the planning and execution of

health programs, Bravo stated. This service is responsible for the provision of public health services to the whole population and provides medical care services for about 70 to 75 percent of the people. The National Health Service has established two priorities, he said. The first priority had been assigned to comprehensive medical care and protection of the health of mothers and children, the second to nutrition and food.

Although many people feel that the system could be improved, Bravo concluded, all agree that central administration of health services is worth while.

Unified Health Services In Malaya and Singapore

In underdeveloped countries with limited resources, better health can be achieved only by giving priority to the preventive services which are an investment for the future and using any remaining resources for providing curative services, stated Dr. I. S. Falk, of Stonington, Conn. Such a policy can only be carried out through a system of unified health services with salaried staff and regional services, he declared.

In Malaya and Singapore, competent administration of a unified health program has accomplished more with limited resources than would have been possible with separate preventive and curative programs, Falk said. In these countries, only nominal charges are made for personal services. Government health programs are supplemented by the services of private physicians for those who can afford them.

Health Services

The national health program in Malaya is the responsibility of the director of medical service, who works under the Minister of Health and Social Welfare, Falk stated. Local health functions are under the jurisdiction of the state or settlement health departments and local health departments, with partial

Federal control of funds and staffing. Health services provided by the government are supplemented on agricultural estates and mines by hospitals and clinics provided by employers; by voluntary health agencies; and, in urban areas, by private practitioners and hospitals, he said. Mobile health units operate on fixed schedules on the main roads and, in five states, on the rivers.

In Singapore, the responsibility for health services is divided, but coordinated, between the Ministry of Health of the colony and the health department of the city council. Water and sanitation are under the public works department. The official health agencies operate hospitals, clinics, dispensaries, and health centers.

Personnel and Funds

In Malaya, nearly all government health services have full-time staffs, although some part-time personnel are employed now when foreign recruitment is at a standstill. Falk said that in Singapore, with the increasing numbers of graduates from the university's medical school and the government's training school for nurses, there is no acute shortage of personnel.

Public funds finance both community and personal health services in Malaya, although fractional charges cover about 10 percent of the costs of personal services, Falk stated. The government devotes about 10 percent of its budget to health services, and about one-third of this amount is spent for preventive services, he said. With approximately an equal amount spent privately, aggregate expenditures for health are about 3 percent of the national income. In Singapore, aggregate public and private expenditures are about 4 percent of national income, government expenditures accounting for about one-half.

Vital Statistics

Birth rates are stable at 45 births per 1,000 in Malaya and 50 per 1,000 in Singapore, Falk reported. Death

dividuals and families did not receive many home visits or make many office visits in a given year, the cost to those who did require many services was high; 1 family required the equivalent of \$1.270 worth of such medical care in 1 year. The need for comprehensive medical insurance is further indicated by the fact that WMS subscribers seek medical care more often and, once care is sought, receive a greater number of services than do nonsubscribers to the plan.

The study, however, found no indication that WMS subscribers used an unreasonable amount of service. It has sometimes been assumed that subscribers to comprehensive medical care plans will seek the services of a physician for trivial reasons more often than will those with limited or no insurance. In Windsor, 33 percent of the subscribers to WMS requested no care at all during the year; 26 percent used the services of a physician only once, compared with 33 and 36 percent, respectively, of those in the limited and no-insurance categories. For all, with comprehensive, limited, or no insurance, the percentages using the service of a physician 2 or 3 times were about the same.

The additional cost of insurance providing comprehensive medical care has been willingly accepted by the population of Windsor. In fact, to retain their present benefits, 80 percent of WMS subscribers would pay increased premiums. Subscribers to limited benefit plans are willing to pay larger premiums for the WMS type of protection and, given the opportunity to enroll in an insurance plan, about two-thirds of the group who have no medical care insurance would be willing to pay the WMS premium.

Physician-Patient Relation

The fear that, with no direct payment required, patients will "shop around" for medical care has proved to be unfounded. About 92 percent of WMS subscribers have one physician to whom they go when they need medical care. Approxi-

mately the same proportion, about 70 percent, of WMS subscribers and nonsubscribers, received all of their home and office care from their regular physician, about 20 percent saw 2 different physicians, and very few in either group saw 3 or more practitioners.

Physician's Income

The effect of a fixed schedule of fees on the physician's income is a major issue in medical care insurance plans. Under WMS, Windsor physicians consider that their incomes equal or exceed the income they expected to be receiving at the current point in their careers. Fee schedules for WMS and private charges were quite similar. WMS subscribers provide 68 percent of the patient load of Windsor physicians and 60 percent of their total income. The majority of physicians considered the WMS fee schedule reasonable. About 70 percent of physicians reported that the plan had helped them gain a steady, assured income, and more than half said that the plan had helped them to build up their practices.

Administration and Costs

Apparently there is little friction or antagonism between WMS physicians and administrators of the plan. Administrative routines were generally satisfactory, and 96 percent of the physicians wanted no changes made in reporting methods.

Cost accounting has disproved the assumption that processing of small claims incurred under prepayment plans such as WMS approaches the cost of the claim itself. The average processing cost per claim was 14 cents, or 2.3 percent of the claim. The per service cost was 9 cents.

Latin-American Countries Extend Health Services

Economic, social, and educational factors have governed the organization of medical care in Latin America, stated Dr. Alfredo Leonardo Bravo, chief, social and occupational health section, World Health Or-

ganization, Geneva, Switzerland. No generalization should be made, he said, since local conditions in other countries may lead to an entirely different approach.

Relatively high salaries are found only in large cities, where industry is concentrated, Bravo said. A large proportion of the population lives in agricultural areas, where salaries are one-third to one-fourth of those in industrial areas. In 50 percent of the countries the average per capita income is only \$150 a year.

In the cities, a large proportion of industrial workers live in slums, Bravo said. Transportation and communications are poor and illiteracy is common. In 9 out of 20 Latin-American countries, 50 percent of the population is illiterate, and in one country the percentage is 89.5. Because of this pattern of poverty and ignorance, only a small minority are able to make any provision for medical emergencies. The large majority cannot, or are reluctant to, join a prepayment plan or even to pay for medical services.

Health Services

According to Bravo, the first health services in Latin America were provided through the beneficencia public hospitals, which were established in the 16th century. Hospitals still preserve the character of these early institutions in the provision of free care to the indigent by part-time physicians who receive only a token salary, he said.

In Latin America today, a basic need in any public health program is the medical treatment of patients, Bravo stated. However, during the treatment period, when the patient and his family are concerned with health questions, the physician has an opportunity to interest them in public health matters such as nutrition and sanitation.

The shortage and uneven distribution of health personnel have limited medical services in Latin America, prevented the development of a good system of death certification, and hampered the development of health statistics, Bravo declared.

"The specialist in communications, oral, written, and visual, is an important member of the modern health team. This fact is evident in the growing number of these personnel who are taking their places on the staffs of voluntary and professional health organizations and of official agencies at all levels of government."



The Health Message

JOHN D. PORTERFIELD, M.D.

A HALL OF HEALTH offers an excellent device for imparting knowledge about health and disease. We in the Public Health Service are proud to have had a part in the re-birth of a Hall of Health in the great Smithsonian Institution. The information on human anatomy and physiology which it presents should have a substantial impact on the knowl-

edge and behavior of the many thousands of visitors to the Institution each year.

Within the limits of time and space, the exhibit is probably among the best devices man has invented to communicate facts and ideas about the physical world. At its best, it combines the advantages of language and visual presentation in a specific and coordinated message with a high teaching potential. From the scratched stone drawings of ancient times to the sophisticated three-dimensional clay models of today, exhibits have been used to teach and to stimulate interest.

Certainly, the exhibit has long been an im-

Dr. Porterfield is Deputy Surgeon General of the Public Health Service. The address was delivered at the ceremony opening the Hall of Health, Smithsonian Institution, Washington, D. C., November 2, 1957.

rates have fallen to about 12 per 1,000 in Malaya, less than 9 per 1,000 in Singapore. In Malaya, infant mortality, formerly 100 to 200 per 1,000 births, is down to about 75. Maternal mortality in Singapore has dropped from 3 to fewer than 1 per 1,000 live births.

There are still many health needs in both countries, Falk stated. In

Malaya, tuberculosis is highly prevalent and as yet is not effectively controlled. Venereal disease is widespread, but the number of known cases is declining steadily. Rural health services are still in the developmental stage. Mental disease services are acutely inadequate. Health education still has difficult problems. In Singapore, the most

serious disease is tuberculosis, he said, although much has been done to combat it through direct attacks and health education.

The success of unified health services in Malaya and Singapore invites study of this pattern of services by health authorities for application to other underdeveloped countries, Falk concluded.

Universities Expand Curriculums

University of California. Three new courses in air pollution research and control enable graduate students to obtain advanced degrees with emphasis in that field in the School of Public Health or in the College of Engineering at the University of California, Berkeley.

These courses are urban meteorology; a lecture and seminar course in atmospheric pollution control; and a laboratory and lecture course in atmospheric pollution, including areawide monitoring. At least two of the subjects will be offered in a 6-week summer session in 1958.

A range of courses in allied fields may be used to complete requirements for an advanced degree. Further information may be obtained from Dean C. E. Smith, Public Health, Dean M. P. O'Brien, Engineering, or Professor B. D. Tebbens, University of California, Berkeley 4, Calif.

University of Michigan. During March 19-21, 1958, the University of Michigan School of Public Health, in collaboration with the Illuminating Engineering Society, will present a course on light and vision. The course is designed to identify and illustrate principles that underlie seeing in various lighting environments, and to outline measures by which these principles may be employed to obtain optimum conditions for seeing, particularly in schools and offices.

Further information may be obtained from H. E. Miller, Director, Continued Education Service, School of Public Health, University of Michigan, Ann Arbor.

From June 19 through August 1, 1958, the university will offer courses in public health statistics. These summer courses, elementary, intermediate, and advanced, are part of a cooperative program carried out by accredited schools of public health and supported by a research training grant from the National Institutes of Health, Public Health Service.

The summer program is designed for statisticians and epidemiologists with health agencies, health workers in voluntary agencies and pharmaceutical companies, and graduate students, research workers, and teachers in statistics and the health sciences.

For graduate students, these are credit courses. Deadlines for applications and transcripts are May 1 for nonresidents of Michigan and June 1 for residents. Application forms and further information can be obtained from the Director of the Summer Program in Public Health Statistics, School of Public Health, University of Michigan.

University of North Carolina. The department of sanitary engineering of the School of Public Health, University of North Carolina, now offers a graduate program leading to the degree of doctor of philosophy.

Candidates for the doctorate must have a master's degree in sanitary engineering, sanitary science, or sanitary chemistry and biology.

Fellowships and assistantships in research and teaching are available. Information may be obtained from the Department of Sanitary Engineering, P. O. Box 899, Chapel Hill, N. C.

portant means of communication in the fields of science and medicine.

The first American scientific exhibit as it is known today was displayed at the annual meeting of the Indiana State Medical Association in 1899. It consisted of a large collection of pathological specimens prepared by two Indianapolis physicians. It was such a great success that the two physicians displayed it the same year at the meeting of the American Medical Association held in Columbus, Ohio. Since 1900, the scientific exhibit has been an official part of the annual meeting of that association.

Today every sizable group in the health field gives the exhibit equal status with scientific papers and other original presentations.

But exhibits also have broader and more general uses. With the complex growth of our society, it has become necessary to use the exhibit not only as a professional and scientific tool but also as a means of reaching the general public. In 1904 the first tuberculosis exhibit for the general public was developed in Baltimore. It attracted nationwide attention, and was soon followed by a similar display at the American Museum of Natural History in New York where it was seen by thousands of visitors. The following year, the exhibit toured the Eastern States, under the sponsorship of the newly organized tuberculosis association and the guidance of one of the early disciples of visual health presentation, Evart G. Routzahn.

Since that time, the health exhibit has become a staple of numerous meetings and shows, and particularly of State and county fairs in rural areas. The modern era, however, ushered in many new and wondrous communications media: films, filmstrips, radio, and television. In comparison with these devices, the exhibit was thought to be archaic as a health education technique. Enthusiasm for exhibits seemed to wane.

Yet in 1939-40 the special hall of "Medicine and Public Health" of the New York World's Fair drew an estimated audience of 7½ million people. A popular health fair organized in 1954 in Miami, Fla., by the American Medical Association, with exhibits of the major professional, voluntary, and governmental health agencies of this Nation, attracted about 50,000

visitors in 4 days. There were comparable crowds at subsequent health fairs in such cities as Los Angeles, Cincinnati, and Oklahoma City.

I believe this is indicative of a number of things, but primarily of the tremendous popular interest in health matters. A recent survey, for example, revealed that newspaper readers wanted to see more articles on health than on any other single subject. Most of the major mass circulation magazines have special science and health departments. Popular pamphlets on health and hygiene reach millions of readers each year.

This reservoir of interest and awareness represents a challenge to us in public health as it does to those in the broad field of education.

As specialization in medicine and science becomes narrower and deeper, as new knowledge emerges from laboratories and research institutions, and as modern life becomes increasingly complex, it is essential that we rely more and more on easily understood methods of communication.

Since World War II, the volume of medical research in this country has increased about fivefold. We are beginning to make inroads on the problems posed by chronic illness and an aging population. There are things that can be done to treat some forms of heart disease, tests of value in diagnosing some forms of cancer, and new techniques in the treatment of mental illness. Thus, the pool of information which demands interpretation and application continues to grow.

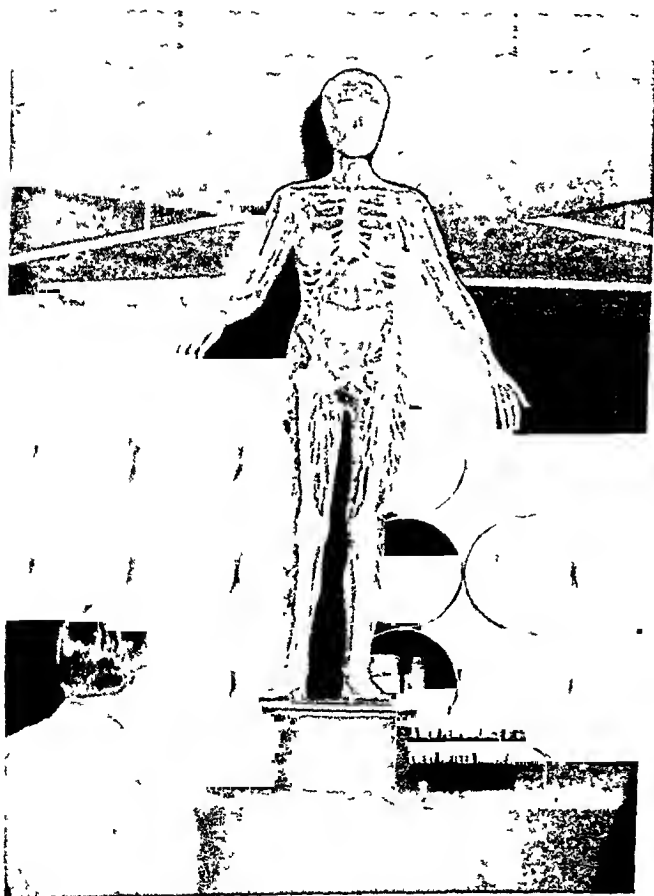
To us in public health, this means that the specialist in communications, oral, written, and visual, is an important member of the modern health team. This fact is evident in the growing number of these personnel who are taking their places on the staffs of voluntary and professional health organizations and of official agencies at all levels of government.

For many years, for example, the Federal Government has made use of exhibits to help convey useful information of all kinds, both to professional groups and to the general public. In the health field, the medical museum was started by the Army during the Civil War. For almost a century, this nearby neighbor of the Smithsonian has made significant contri-

Hall of Health



Modern exhibit techniques in the Smithsonian Institution's new Hall of Health both educate and fascinate as they develop the theme: "Through the Ages, Man's Knowledge of His Body." Opened in November 1957 in the Arts and Industries Building, the hall stresses health rather than disease.



Exhibits illustrate effectively how the normal, healthy body is put together and how it works. Stages in embryo growth, birth and growth of a baby, bones and muscles, teeth, heart and circulation, digestion, respiration, endocrine glands, eye, ear, and nervous system are all represented.

Historical units display detailed reproductions of votive offerings, ancient manuscripts, and pages from the earliest printed books showing embryology, the skeleton, heart, brain, and digestive system as our ancestors knew them.

A center of attraction is the transparent figure of a woman (left) which, through electronics, light, and sound, shows the site and explains the function of major organs in the body. Other pushbutton exhibits reveal the inside of the human heart, anatomy of the tooth, site and action of endocrine glands, and brain function of a baseball player at bat.

The popular wall exhibit, "Growing, Growing, Grown," has a series of cutout forms of varying sizes (above) for determining typical heights of children at years 3, 6, 9, 12, and 15. Activities characterizing each age are illustrated in photographs mounted at appropriate intervals along the cutout series.

Audiometric Testing of School Children

SAMUEL M. WISHIK, M.D., ELIZABETH R. KRAMM, M.A., M.P.H.,
and ELVIRA M. KOCH, R.N.

HEARING of school children in Reading, Pa., was tested biennially during the 8 school years 1946-47 through 1953-54 by the staff of the Reading School District. In 1952, results of these tests were used in a study of 1,726 children in the fifth and sixth grades conducted under the auspices of the School Health Committee of the Pennsylvania Public Health Association. These children were selected because they had been tested biennially for a 6-year period. The 6-year study included prognostic implications and the relationship of hearing to academic retardation. In a report of the 1952 findings, the effectiveness of a biennial audiometric testing routine was evaluated, procedures for sweep check and threshold audiometric tests were described, and some of the definitions used in the study were given (1).

The present report covers the 8-year period 1946-54. The study continues to explore the question of the optimum periodicity of routine audiometric testing, measures the apparent impact of hearing impairment on academic progress, identifies certain prognostic signs, makes observations on the audiometric patterns of children between 5 and 14 years of age. Audiograms have been analyzed and the data are presented according to the ear involved and the age of the children rather than their

grade level. Since reasonably complete information on medical findings and treatment was not available, this important aspect of the problem cannot be reported. Administrative recommendations and research suggestions are offered in the light of the findings.

During the period from 1952 to 1954, 1,592, or 92 percent, of the 1,726 children previously reported on (1) had at least one audiometric test. Other than those who transferred out of the Reading public schools, only 36 children from the original study group who were still attending school were not tested.

Method

Frequencies on the audiogram were divided into low, middle, and high ranges. Frequencies 128 and 256 were included in the low range; 512, 1,024, and 2,048 in the middle range; and 4,096 and 8,192 in the high range. Frequencies 2,896 and 5,792, not done routinely, were included in the high range. Frequency 11,584 was not used in this study although it was included in the test procedure. Overlapping of frequency ranges was avoided in order to facilitate the drawing of statistical conclusions. In the remainder of the paper, frequencies will be referred to in round numbers.

To pass the threshold test, a child was expected to hear frequencies 250-4,000 at 20 decibels, frequencies 125 at 25 decibels, and frequencies above 4,000 at an average of 30 decibels. He was considered to have failed the test if his hearing fell below the standard in two or more frequencies in either ear. The average of frequencies above 4,000 was counted as one frequency.

Dr. Wishik is professor of maternal and child health and Miss Kramm is research associate in maternal and child health, Graduate School of Public Health, University of Pittsburgh. Miss Koch is a school nurse with the Reading School District, Reading, Pa. This paper was presented in part at the annual meeting of the American Public Health Association in Atlantic City, N. J., November 14, 1956.

butions to medical knowledge through its exhibits. The Public Health Service, too, has found this technique of communication invaluable, as have State and local health departments.

Today's challenge is no less great for such great institutions as the Smithsonian. The exhibit will always have a place in health education. As long as a youngster's curiosity is whetted by a visual presentation of the marvelous mechanism that is the human heart, then exhibits have no peer as a health teaching resource. As long as there is zest for knowledge, then there is a need for new and better and more vivid ways of bringing that knowledge to people.

Certainly we need to know more about how people learn through visual experience. We need to know how to improve the presentation of facts and information and arguments through visual means. We need to know how to take advantage of the "teachable moment" that a superior kind of exhibit can make possible.

Bruno Gebhard, director of the famous Cleveland Health Museum, has called a permanent health museum a "people's university," where visitors may see, study, and learn at their own pace and in their own way. In this new Hall of Health, the Smithsonian Institution has a "people's university" offering guidance to better health for more Americans.

Divorce and Annulment Data Collection Improved

An improved system of collecting statistics on divorce and annulment of marriage was adopted January 1, 1958, by the Public Health Service. A divorce and annulment registration area has been set up as a start toward obtaining figures on divorces and annulments as reliable and comprehensive as on births and deaths.

Since some States do not collect statewide figures on divorces and annulments, national statistics are based partly on estimates.

The new system not only provides a more accurate count, but also includes additional social and economic data on family breakdowns, information of value to courts, health and welfare agencies, and other groups dealing with dependency, juvenile delinquency, mental illness, and related problems.

The uniform data will be collected by the National Office of Vital Statistics, in cooperation with 14 States and 3 Territories: Alabama, Georgia, Idaho, Iowa, Montana, Nebraska, Oregon, Pennsylvania, South Dakota, Tennessee, Utah, Virginia, Wisconsin, Wyoming, Alaska, Hawaii, and the Virgin Islands.

failed." The failures were fairly evenly distributed within each age group (table 2). The high percentage of failures among children 14 years old and older should be disregarded since these are an atypical group. Sixty-five, or 7.5 percent, of 869 boys failed an audiometric test at some time during the study compared with 51, or 6.0 percent, of 857 girls.

The age distribution shown in table 2 is of no help in assessing the case-finding effectiveness of the biennial test program in children of different ages since it does not indicate how many new cases of hearing impairment were discovered in each age group. Nor would data on age at first discovery of hearing impairment give information on the increment resulting from a biennial test program unless all new cases had been tested in the biennium immediately prior to their first failure and had passed that test. Only these children can correctly be defined as "candidates for first failure by biennial retest."

Table 2. Number children tested and number and percentage who failed a test, according to age group at time of test

| Age group (years) | Number tested | Failed | |
|-------------------|---------------|--------|---------|
| | | Number | Percent |
| 5-7----- | 1, 336 | 31 | 2.3 |
| 8-9----- | 1, 595 | 64 | 4.0 |
| 10-11----- | 1, 661 | 52 | 3.1 |
| 12-13----- | 1, 467 | 45 | 3.1 |
| 14 and over----- | 176 | 18 | 10.2 |

The percentage of such candidates who failed the test drops progressively with age, from 2.3 percent in the age group 8-9 years to 1.0 percent in the group 10-11 years old, to 0.8 percent in the next higher age group (table 3). In other words, the returns from routine biennial retesting become progressively smaller as the test program continues through the age groups.

In sharp contrast, the percentage of children who failed the first audiometric test increased with age (table 4). Obviously, delayed first testing occurred in a selected group of children who had a high rate of failure in the audiometric test. This kind of experience has contributed to the impression that newly developed

Table 3. Number of candidates for first failure at biennial retest, according to age group, and number and percentage of new cases found

| Age group (years) | Candidates for first failure, at biennial retest ¹ | New cases | |
|-------------------|---|-----------|---------|
| | | Number | Percent |
| 8-9----- | 1, 243 | 28 | 2.3 |
| 10-11----- | 1, 449 | 14 | 1.0 |
| 12-13----- | 1, 329 | 10 | .8 |

¹ "Candidates" are defined as children who had never previously failed an audiometric test and who had been tested in the immediately preceding age group.

hearing impairment occurs rather often among older children, whereas hearing loss probably existed for an unknown time prior to the time of the first audiometric test and prior to discovery of hearing impairment in many instances.

Data on longitudinal observations of the entire study group indicate that the results of the first tests given to a group of children make it possible to identify the majority of those who will fail an audiometric retest (table 5). Among the 1,305 children who passed the hearing test in the first age group, 43 (3.3 percent) failed a subsequent test, and only 12 (1.1 percent) of the 1,062 children tested in the group aged 12-13 years showed a failure at that time. On the other hand, among the 31 children in the first age group who failed the test, 15 (48.4 percent) failed again later, and 9 (29.0 percent) failed at 12-13 years of age.

Even though subsequent test histories of those passing and those failing the first audiometric test differ greatly, a subsequent failure

Table 4. Number of children taking audiometric test for first time and number and percentage of new cases discovered, according to age group

| Age group (years) | Children taking test for first time | New cases | |
|-------------------|-------------------------------------|-----------|---------|
| | | Number | Percent |
| 5-7----- | 1, 336 | 31 | 2.3 |
| 8-9----- | 321 | 23 | 7.2 |
| 10-11----- | 66 | 6 | 9.1 |
| 12-13----- | 3 | | |

The scale of severity of hearing impairment was: average hearing at 20 decibels or less, normal; 21-30 decibels, slight hearing loss; 31-40 decibels, moderate loss, and over 40 decibels, severe loss. Despite differences in passing standards, the same scale was applied to all three frequency ranges, in order to give full consideration to the possible significance of the very low and the very high ranges.

Periodicity of Testing

A routine biennial testing program should reach 50 percent of the total school enrollment each year. This was accomplished by routinely testing all children in the first, third, and fifth grades. More than 50 percent of the children were tested each year except in 1946-47 and 1947-48, the first 2 years of the study, when 48.1 and 46.7 percent, respectively, were tested. In addition to the routine tests in the odd grades, children were tested whenever special indications existed. Therefore, more than 50 percent were usually tested in any year. The largest number tested in any one year during the study period was 69 percent.

A tally of the number of children given an audiometric test in a particular year does not give a complete picture of the extent to which a given child is tested during his school career.

When a testing routine is administratively organized by school grades, the goal of biennial testing of a given child can be disrupted by late admission to school, early dropout from school, or repetition of grades. The age groups studied were 5-7, 8-9, 10-11, 12-13, and 14 years and over (table 1). Sixty-nine percent of the children were tested over the desired span of four or more 2-year intervals. Among the 116 children who failed a test at any time during the study, 70, or 60 percent, had this span of test coverage, and all but 3 of the remaining children were carried through 3 age groups.

The span of coverage by age groups indicates the time from beginning to end of the testing of any given child but does not imply that there was continuity or completeness of testing within that period. Table 1 indicates the longitudinal extent of the study and demonstrates that, despite the greater administrative problem, any routine program of periodic audiometric testing should be scheduled for individual children by age group rather than by academic grade.

Effectiveness of Periodic Retesting

Of the 1,726 children in the study, 116, or 6.7 percent, failed an audiometric test one or more times. These children are designated as "ever

Table 1. Age span of audiometric test coverage of total study population and of children who ever failed a test

| Age-group span | Number age groups spanned | Children | | | | | |
|--------------------------------|---------------------------|----------|-------------|---------|-------------|--------|-------------|
| | | Number | | Percent | | | |
| | | Tested | Ever failed | Tested | Ever failed | Tested | Ever failed |
| Total..... | | 1,726 | 116 | 100.0 | 100.0 | 100.0 | 100.0 |
| 5-7 through 14 and over..... | 5 | 29 | 8 | 1.7 | 6.9 | 1.7 | 6.9 |
| 5-7 through 12-13..... | 4 | 1,075 | 50 | 62.3 | 43.1 | 67.7 | 53.1 |
| 8-9 through 14 and over..... | | 93 | 12 | 5.4 | 10.3 | | |
| 5-7 through 10-11..... | 3 | 221 | 17 | 12.8 | 14.6 | 27.7 | 37.0 |
| 8-9 through 12-13..... | | 206 | 17 | 11.9 | 14.6 | | |
| 10-11 through 14 and over..... | | 51 | 9 | 3.0 | 7.8 | | |
| 5-7 through 8-9..... | 2 | 11 | — | .6 | — | 3.0 | 2.6 |
| 8-9 through 10-11..... | | 22 | 1 | 1.3 | .9 | | |
| 10-11 through 12-13..... | | 15 | 2 | .9 | 1.7 | | |
| 12-13 through 14 and over..... | | 3 | — | .2 | — | | |

tinuous hearing defect" after failure of an audiometric test had first occurred.

In view of the common occurrence of a short duration of hearing loss, is the biennial test interval too long? How many new cases would be discovered by an annual testing program? On 427 occasions, 302 children who had never failed a hearing test were retested 1 year after a previous test. In a sense, these children were "candidates for first failure by annual retest." Fourteen, or 3.2 percent, failed. The failure rate was 4.7 percent for the children under 10 years of age and 2.2 percent for those 10 years old or older.

Valid conclusions on the effectiveness of annual retesting of hearing cannot be drawn from a biennial testing program. In this study, some children were tested after a 1-year interval because of suspected hearing loss or repetition of a grade. However, appreciable numbers of children, particularly in the younger age groups, show hearing impairment some of the time within a 2-year interval. The only way to determine the value of annual retesting is to study the number of new cases found in an annual testing program.

Hearing Impairment on Entering School

An appreciable amount of hearing loss undoubtedly starts in the preschool years. Therefore, in the age group 5-7 years, children who

had hearing impairment at the time of the first audiometric test were compared with children who had normal hearing in the early school years but subsequently failed a hearing test. Criteria selected for comparison were continuity and severity of hearing impairment and involvement of one or both ears.

The 31 young children who had hearing difficulty when they entered school had the lowest proportion of "temporary-short" impairment of hearing, that is, no audiometric test failures after the first failure. Their percentage of temporary-short involvement was 36 compared with 63, 42, and 50, respectively, among the children who had normal hearing on admission but first failed a test in the later age groups (28 children in the 8-9 group, 15 in the 10-11 group, and 11 in the 12-13 group). The moderate difference between the entering pupils and older pupils is more noteworthy because it is directly contrary to the relatively common occurrence of temporary loss of hearing in the younger children as a whole. Four-fifths of the temporary-short failures in the study group occurred before 10 years of age. This tends to support the belief that the hearing impairment in entering pupils was not an acute transient episode but had been present prior to admission to school.

The same young children showed other evidence of having greater hearing damage than the older groups. At the time of first failure of

Table 6. Number and percentage distribution of children and separate ears ever failing an audiometric test, according to chronicity of hearing defect

[In rank order of frequency]

| Chronicity | Number | | Percent | |
|---|----------|------|----------|-------|
| | Children | Ears | Children | Ears |
| Total..... | 116 | 177 | 100.0 | 100.0 |
| Temporary short ¹ | 47 | 81 | 40.5 | 45.8 |
| Continuous ² | 33 | 42 | 28.5 | 23.7 |
| Temporary extended ³ | 20 | 26 | 17.2 | 14.7 |
| Indeterminate ⁴ | 8 | 10 | 6.9 | 5.6 |
| Intermittent ending in failure ⁵ | 4 | 10 | 3.4 | 5.6 |
| Intermittent ending in pass ⁶ | 4 | 8 | 3.4 | 4.5 |

¹ Failing 1 test only and passing subsequently.

² Failing all tests after first failure.

³ Failing consecutive tests more than once but ending in a pass.

⁴ Passing all tests except the last.

⁵ Passing a test between failures and ending with a failure.

⁶ Passing a test between failures and ending with a pass.

Table 5. Sequence of results of audiometric retests, according to first test findings on 1,726 children, by age group

| 5-7 years | 8-9 years | 10-11 years | 12-13 years | | | |
|---------------------|--------------------|--------------------|--------------------|------|------------|----|
| | | | Pass | Fail | Not tested | |
| Pass..... 1,305 | Pass..... 1,215 | Pass..... 1,187 | 965 | 1 | 198 | |
| | | Fail..... 11 | 5 | 3 | | |
| | | Not tested..... 37 | 26 | 11 | | |
| | Fail..... 28 | Pass..... 18 | 17 | 1 | | |
| | | Fail..... 10 | 1 | 5 | | |
| | | Not tested..... | | 4 | | |
| | Not tested..... 62 | Pass..... 61 | 55 | 6 | | |
| | | Fail..... | | | | |
| | | Not tested..... 1 | 1 | | | |
| | Fail..... 31 | Pass..... 18 | Pass..... 16 | 8 | 8 | |
| Fail..... 1 | | | 1 | | | |
| Not tested..... 1 | | | | 1 | | |
| Fail..... 13 | | Pass..... 4 | 3 | 1 | | |
| | | Fail..... 9 | 1 | 3 | | |
| | | Not tested..... | | | | |
| Not tested..... 390 | | Pass..... 298 | Pass..... 271 | 246 | 1 | 24 |
| | | | Fail..... 4 | 2 | 2 | |
| | | | Not tested..... 23 | 22 | 1 | |
| | | Fail..... 23 | Pass..... 12 | 9 | 2 | 1 |
| | Fail..... 11 | | 2 | 9 | | |
| | Not tested..... | | | | | |
| | Not tested..... 69 | Pass..... 60 | 53 | 5 | 2 | |
| | | Fail..... 6 | 3 | 3 | | |
| | | Not tested..... 3 | 3 | | | |

rate of 3.3 percent in the passing group is still too high to discontinue retesting. But the justification for discontinuing testing grows stronger with each retest. Children who have passed all tests while in the first two groups are unlikely ever to fail subsequently. Eleven of 1,215 children in this category failed the test at 10-11 years, a failure rate of 0.9 percent, and only 7 out of 1,003, or 0.7 percent, of those tested failed in the group aged 12-13 years. When children miss taking a test in 1 of the first 3 age groups but pass in the other 2 groups, a similarly favorable pattern is present; only 1 out of 327, or 0.3 percent, failed after passing both tests done in the first 3 groups.

If routine audiometric testing had been discontinued for children successively passing the audiometric test in two early age groups without a history of any test failures, only approximately half the routine tests reported would have been done. If such a restricted procedure had been followed and if reliance had rested entirely on the routine testing program, 16, or 13.7 percent, of the failing children would have been missed. The suggestion that the age span

of the routine part of the test program be restricted will be modified later in the light of other findings.

Chronicity of Hearing Loss

A more detailed analysis of the longitudinal pattern of test results among the 116 children who ever failed a hearing test gives additional clues to answer the question, What is the best timing and frequency of routine audiometric testing? Most of these children did not have continuous hearing loss. They failed the audiometric test 275 times, or 49.3 percent of the 558 tests they took. The extent of "chronicity" among them and in their 177 ears whose hearing was ever affected is shown in table 6. The distribution of chronicity of hearing loss among pupils and among ears was similar. About half the audiometric test failures, those in the "temporary short" and "indeterminate" groups, were not repeated. There were other nonpermanent types of hearing loss; only 29 percent of the failing pupils and 24 percent of the failing ears fell into the definition of "con-

Table 8. Total number of children and number and percentage who repeated one or more grades, according to audiometric test history

| Audiometric test history | Total children | Repeated one or more grades ¹ | |
|--------------------------|---------------------|--|---------|
| | | Number | Percent |
| Total..... | ² 1, 722 | 333 | 19. 3 |
| Never failing..... | ² 1, 606 | 294 | 18. 3 |
| Ever failing..... | 116 | 39 | 33. 6 |

¹ Excludes children admitted to first grade under 6 years of age who repeated the first grade only.

² Excludes 4 children whose record of grade repetition was unavailable.

NOTE: $\chi^2=14.89$ $P<.001$.

children who entered school late. Because these children often deviated from the routine grade placement, they tended to miss the scheduled tests for their group and to have recognition of their hearing impairment still further postponed.

Repetition of Academic Grades

Children who ever had hearing impairment during their school lives were twice as likely to repeat a grade as were other children (table 8). The magnitude of the impact of hearing impairment on academic status can also be sought through the grade repetition ratio, or the total number of grades repeated per 100 children. This ratio was 46 among children who ever failed an audiometric test compared with 20 among those who never showed hearing impairment. Thus, a child with a hearing defect not uncommonly repeats more than one academic grade during his school career.

In the present study it was not possible to examine the time relationship between hearing loss and school work because the data gave time of recognition of hearing loss rather than time of onset and time of repetition of a grade rather than time of the beginning of poor academic work. Comparison of age of grade repeaters with nonrepeaters at first audiometric test failure and separate comparison of audiometric test failers with nonfailers at first repetition of a grade showed no meaningful differ-

ences. There was no significant pattern of time relationship between first audiometric failure and first repetition of a grade in the 39 children who had both. Furthermore, there was greater delay in the time of audiometric testing of children who repeated grades than in the testing of other children, again apparently due to their falling out of step with the grades of their fellow pupils and being missed by the routine biennial testing program.

Grade at End of Observation

A combination of factors determines a child's academic status at the end of his school career. Therefore, the grade-age relationship at the end of the observation period was set up as the third index of possible impact of hearing impairment upon school work. Among the 114 children who ever failed an audiometric test, 38.6 percent had not reached their normal academic grade level at the terminal point of the study, whereas only 24.4 percent of the 1,609 children who had not shown hearing impairment at any time in their school career were behind their expected grade at the end ($\chi^2=13.66$ $P<.001$). The audiometric failure rate was far greater among children 2 years behind their age group than among those 1 year behind, and 3 times as high as among children at

Table 9. Number and percentage distribution of children with unfavorable audiometric test history, according to age-grade relationship at last observation

| Age-grade relationship | Number tested ¹ | Ever failed a test | |
|-------------------------|----------------------------|---------------------|---------|
| | | Number ² | Percent |
| Total..... | 1, 723 | 114 | 6. 6 |
| Normal age level..... | 1, 286 | 70 | 5. 4 |
| 1 year behind..... | 246 | 17 | 6. 9 |
| 2 years behind..... | 124 | 21 | 16. 9 |
| 3 and 4 years behind... | 67 | 6 | 9. 0 |

¹ Excludes 3 children whose grade classification was unavailable.

² Excludes 2 children whose grade classification was unavailable.

NOTE: Chi-square based on 2 x 2 table for normal age level and 2 years behind, $\chi^2=28.94$ $P<.001$; 1 and 2 years behind, $\chi^2=9.08$ $P<.01$; normal age level and 3 and 4 years behind, $\chi^2=1.12$ $P<.30$.

an audiometric test, the children in the youngest age group had a much higher percentage of bilateral involvement (71 percent) than those in the other three age groups (38, 47, and 45 percent, respectively), as well as greater severity of hearing loss in the middle frequency range. Average weighted scores of severity of hearing impairment for the four age groups were 150, 136, 86, and 50, respectively. Weights of 100, 200, and 300 were given for slight, moderate, and severe involvement of the middle frequency range. Poorer audiometric scoring in the youngest group is all the more meaningful in the face of the greater average acuity of hearing that is believed to be normally present in the early years.

Bilaterality and severity of hearing impairment may be related to age differences alone. One demonstrable age correlation in the total study population was the finding that younger children who fail an audiometric test show loss of hearing over a wider spread of frequencies than do the older children, whose hearing impairment is more likely to be focused on a narrower range of frequencies. The decrease in involvement of ranges with increasing age took place in the lower and middle frequencies rather than in the high tones. Age differences did not apply when hearing loss exceeded 40 decibels.

The extent to which a child suffers from his

hearing impairment is greatly influenced by whether one or both ears are affected. Among the 116 children who ever failed an audiometric test, laterality of involvement was known for 111. Half of these had bilateral loss of hearing at the time of first failure of an audiometric test. Among the group 5-7 years old, 69 percent of all failures were bilateral compared with 45-47 percent in each of the three older age groups.

Impact Upon Academic Progress

The possible effect of hearing impairment on a child's school work was studied in three ways: by age on admission to school, by repetition of academic grades, and according to grade at the end of observation.

Age of Admission to School

Among the children admitted to school at the normal age level (below 7 years), 5.9 percent ever failed a hearing test during the study period compared with 11.5 percent of those whose admission to school had been delayed. This is a statistically significant difference ($\chi^2=11.8$ $P<.001$), which may connote that undiscovered hearing loss was associated with and may have contributed to delay in acceptance at school. Also, 16 of the 28 children whose admission to school was delayed and who failed an audiometric test at some time failed the first time they were tested.

Intermittent hearing loss may exist prior to as well as after admission to school. Among the children who entered school late but passed the first audiometric test, the failure rate in the group aged 8-9 years was 3½ times the rate among children who were admitted to school at 5-7 years of age and passed their first audiometric test.

Gross delay in admission to school probably results from causes other than hearing defect. Among 218 children who entered school 1 and 2 years late, 12.0 and 13.5 percent, respectively, ever failed an audiometric test whereas, among the 26 children admitted to school 3 or more years late, only one instance of hearing loss was then or subsequently discovered (table 7).

The delay in receiving the first audiometric test was appreciably greater than usual among

Table 7. Total number of children and number and percentage with unfavorable audiometric test history, according to age at admission to first grade

| Age level at time of admission to first grade | Total children ¹ | Ever failed test | |
|---|-----------------------------|------------------|---------|
| | | Number | Percent |
| Total..... | 1, 724 | 116 | 6. 7 |
| Normal ² | 1, 480 | 88 | 5. 9 |
| 1 year behind..... | 166 | 20 | 12. 0 |
| 2 years behind..... | 52 | 7 | 13. 5 |
| 3 and 4 years behind..... | 26 | 1 | 3. 8 |

¹ Excludes 2 children whose age at time of admission was unavailable.

² Below 7 years.

NOTE: Chi-square based on 2 x 2 table for normal age level and 1 year behind, $\chi^2 = 11.73$ $P<.001$; and for normal age level and 2 years behind, $\chi^2 = 5.85$ $P<.02$.

Table 11. Number and percentage of classes of chronicity¹ of hearing impairment, according to combinations of frequency ranges affected at time of first failure of an ear
 [Arranged in rank order of percentage distribution of continuous impairment]

| Combinations of frequency ranges | Total ² | Number | | Percent | |
|----------------------------------|--------------------|------------|----------------------------|------------|----------------------------|
| | | Continuous | Temporary and intermittent | Continuous | Temporary and intermittent |
| Total..... | 148 | 37 | 111 | 25.0 | 75.0 |
| Middle and high..... | 22 | 14 | 8 | 63.6 | 36.4 |
| High only..... | 17 | 7 | 10 | 41.2 | 58.8 |
| Low and high..... | 5 | 1 | 4 | 20.0 | 80.0 |
| Low and middle..... | 23 | 4 | 19 | 17.4 | 82.6 |
| Middle only..... | 6 | 1 | 5 | 16.7 | 83.3 |
| Low, middle, and high..... | 67 | 9 | 58 | 13.4 | 86.6 |
| Low only..... | 8 | 1 | 7 | 12.5 | 87.5 |

¹ See footnotes to table 6.

² Excludes 10 ears with "indeterminate impairment" and 19 ears for which audiogram of first audiometric test failed was unavailable.

was: high plus middle, high plus low, and middle plus low.

With one exception, hearing impairment in two ranges increased the tendency to continuous hearing failure, as follows:

High plus middle was more chronic than high alone.

High plus middle was more chronic than middle alone.

High plus low was less chronic than high alone (the exception).

High plus low was more chronic than low alone.

Middle plus low was more chronic than middle alone.

Middle plus low was more chronic than low alone.

When hearing impairment existed in all three frequency changes, however, continuous failure was least likely.

Since the middle frequencies are the ones essential to functional hearing of speech, it is important that the prognostic significance of early loss of hearing in any frequency range must be assessed in relation to the end point of hearing impairment for the middle frequency range. Detailed analysis helps to explain the rank order of the frequency ranges in respect to their seeming prognostic significance for continuity of hearing impairment (table 11). Although the numbers of ears tested are small,

the differences in chronicity of hearing impairment in the middle frequency range are striking.

Four possible patterns of combination of frequency ranges include the high range. The highest percentages of continuous hearing impairment occurred when hearing impairment at the time of first audiometric test failure had been found in 3 of these 4 combinations (table 11). At first glance, this would suggest that any loss of hearing in the high range at the time of first failure of an audiometric test has great significance for continuity of hearing impairment. From a practical viewpoint, however, this is not so. The correlation existed only with the definition used for failing a threshold test, not with ultimate functional hearing as judged chiefly by middle frequency range loss.

End-point middle frequency range loss of hearing evidently related back to early middle range loss and did not occur to more than a slight extent when no loss of hearing in the middle frequency range had existed at the time of first failure of an audiometric test (table 12). Observation of these children over a longer period of time is necessary to determine whether the slight impairment of hearing in the middle frequency range that sometimes occurred ever becomes more significant. When the first test failure consisted of loss of hearing

normal grade level. In the group with 3 or 4 years of total academic retardation, however, the proportion with hearing impairment dropped, suggesting that other factors, such as mental retardation, entered more fully into the picture (table 9).

Detailed analysis of the longitudinal history of the children revealed a number of characteristic pictures. One group had hearing loss from the beginning and consistently thereafter. Half of these had fallen 2 or more years behind their normal academic level at the end of the study. These children usually had severe bilateral hearing impairment.

Early in their school careers, the children who probably had had a hearing defect prior to admission to school were grossly retarded academically. They were delayed in being admitted to school, missed their audiometric tests for varying lengths of time after admission, and repeated one or more grades before their hearing impairment was recognized. Strangely enough, half of them had only unilateral hearing defect. The nature of the hearing loss and its tendency to eventual improvement suggested an infectious etiology rather than that organic brain damage was the common basis for a nerve type of hearing impairment associated with mental retardation. Unfortunately, information on clinical findings and intelligence testing was not consistently available. In a number of slow-learning children, superimposed mild or moderate hearing impairment seemed to constitute a considerable handicap.

Prognosis

In order to make a retrospective appraisal of the prognostic implications of early audiometric test findings, the following indexes of the course of hearing impairment and its end results were established: chronicity; severity of hearing loss at the last audiometric test in different frequency ranges, especially the middle frequencies; and impairment of hearing in one or both ears at the last test. These indexes were analyzed in relation to (a) hearing impairment in frequency ranges at first test failure, (b) hearing impairment in combinations of frequency ranges at first failure, (c) severity of hearing impairment in the three frequency

ranges at first failure, (d) greatest severity of involvement in the three frequency ranges during the period of observation, and (e) consistency of laterality of hearing impairment.

Frequency Ranges

Among the children followed for 3 or more years after failure of an audiometric test, there was general correlation in the group as a whole between the number and severity of hearing impairments in any one of the three frequency ranges at the time of first test failure and the persistence and degree of loss in that same range at the time of the last test. The correlation held more strongly for high tones than for middle tones and for middle tones than for low tones.

Combinations of Ranges

Table 10 gives the percentage distribution of frequency ranges and combinations of ranges at the time of first failure of the ears that ever failed an audiometric test. Table 11 shows that among the 148 ears for which data on chronicity of hearing impairment were available, 25 percent had continuous audiometric test failure. The direct correlation between height of early hearing impairment on the frequency range scale and tendency of hearing deficit in that same frequency range to persist also was evident when combinations of two frequency ranges were affected at the first failure of a test. The rank order of percentage of continuous failure after early dual range involvement

Table 10. Distribution of combinations of frequency ranges affected at time of first failure of audiometric test by an ear

[Arranged in rank order of percentage distribution]

| Combinations of frequency ranges | Number ¹ | Percent |
|----------------------------------|---------------------|---------|
| Total..... | 158 | 100.0 |
| Low, middle, and high. | 71 | 44.9 |
| Low and middle..... | 23 | 14.6 |
| Middle and high..... | 22 | 13.9 |
| High only..... | 20 | 12.7 |
| Low and high..... | 8 | 5.1 |
| Low only..... | 8 | 5.1 |
| Middle only..... | 6 | 3.8 |

¹ Excludes 19 ears for which audiogram of first audiometric test failed was unavailable.

Table 11. Number and percentage of classes of chronicity¹ of hearing impairment, according to combinations of frequency ranges affected at time of first failure of an ear

[Arranged in rank order of percentage distribution of continuous impairment]

| Combinations of frequency ranges | Total ² | Number | | Percent | |
|----------------------------------|--------------------|------------|----------------------------|------------|----------------------------|
| | | Continuous | Temporary and intermittent | Continuous | Temporary and intermittent |
| Total..... | 148 | 37 | 111 | 25.0 | 75.0 |
| Middle and high..... | 22 | 14 | 8 | 63.6 | 36.4 |
| High only..... | 17 | 7 | 10 | 41.2 | 58.8 |
| Low and high..... | 5 | 1 | 4 | 20.0 | 80.0 |
| Low and middle..... | 23 | 4 | 19 | 17.4 | 82.6 |
| Middle only..... | 6 | 1 | 5 | 16.7 | 83.3 |
| Low, middle, and high..... | 67 | 9 | 58 | 13.4 | 86.6 |
| Low only..... | 8 | 1 | 7 | 12.5 | 87.5 |

¹ See footnotes to table 6.

² Excludes 10 ears with "indeterminate impairment" and 19 ears for which audiogram of first audiometric test failed was unavailable.

was: high plus middle, high plus low, and middle plus low.

With one exception, hearing impairment in two ranges increased the tendency to continuous hearing failure, as follows:

High plus middle was more chronic than high alone.

High plus middle was more chronic than middle alone.

High plus low was less chronic than high alone (the exception).

High plus low was more chronic than low alone.

Middle plus low was more chronic than middle alone.

Middle plus low was more chronic than low alone.

When hearing impairment existed in all three frequency changes, however, continuous failure was least likely.

Since the middle frequencies are the ones essential to functional hearing of speech, it is important that the prognostic significance of early loss of hearing in any frequency range must be assessed in relation to the end point of hearing impairment for the middle frequency range. Detailed analysis helps to explain the rank order of the frequency ranges in respect to their seeming prognostic significance for continuity of hearing impairment (table 11). Although the numbers of ears tested are small,

the differences in chronicity of hearing impairment in the middle frequency range are striking.

Four possible patterns of combination of frequency ranges include the high range. The highest percentages of continuous hearing impairment occurred when hearing impairment at the time of first audiometric test failure had been found in 3 of these 4 combinations (table 11). At first glance, this would suggest that any loss of hearing in the high range at the time of first failure of an audiometric test has great significance for continuity of hearing impairment. From a practical viewpoint, however, this is not so. The correlation existed only with the definition used for failing a threshold test, not with ultimate functional hearing as judged chiefly by middle frequency range loss.

End-point middle frequency range loss of hearing evidently related back to early middle range loss and did not occur to more than a slight extent when no loss of hearing in the middle frequency range had existed at the time of first failure of an audiometric test (table 12). Observation of these children over a longer period of time is necessary to determine whether the slight impairment of hearing in the middle frequency range that sometimes occurred ever becomes more significant. When the first test failure consisted of loss of hearing

in the high frequency range only, the high proportion of continuing failure of the audiometric test was made up almost entirely of persistent failure in the high range exclusively. Only 3 of the 13 ears in this group whose continuous failure of audiometric tests spanned 3 or more years developed even a slight degree of hearing loss in the middle frequency range. As an added check, audiograms were studied of 20 ears in 15 children which had been labeled

"borderline" rather than test failures. These children had shown some loss of hearing at the 6,000 or 8,000 frequency at one time or another but the loss was not enough to drop the high frequency range average below the passing standard. The majority of these children were 8 years of age when hearing loss was first noted and 13 of them were boys. The amount of loss was usually less than 50 decibels, in which case it disappeared within 1 or, at most, 2 years.

Audiometric School Testing Program

ADMINISTRATIVE RECOMMENDATIONS

The administrative recommendations listed below are based upon the findings of the study as they seem to fit together with other experiences, observations, and reports in the field of audiology and in school health programs. The word "school" applies to all grades through high school, without regard to structural or organizational separation. It is not intended that elementary, junior high, and high schools should treat their entering students as entirely new to an audiometric testing program but that continuity in testing should be attained by effective coordination of programs and prompt transfer of health records with the students.

1. School systems and health departments should work jointly for the development of comprehensive routine hearing screening programs among children of preschool age.

2. Organization of the audiometric test programs in schools should be based on ages of children rather than on grade grouping.

3. Screening tests should be given routinely:

a) To all students entering school for the first time. (Highest priority for prompt testing should be given to this group.)

b) Annually to all children under 10 years of age, except those who have ever had hearing impairment.

c) Possibly to all children just prior to their leaving school, espe-

cially among those who terminate their schooling before graduation.

4. Screening tests should be limited to the middle frequency range (500, 1,000, 2,000 decibels).

5. A makeup test should be arranged as soon as possible when children miss taking their routine tests, especially if these children fall into one of the special referral categories listed immediately below.

6. On referral, screening tests should be given to school children of any age when:

a) The teacher, parent, or child himself, suspects hearing is not normal.

b) Infections or allergic involvement of ear, nose, or throat are frequent or excessive.

c) Absenteeism is marked. (Criteria in terms of frequency, length, number, and type of absences, and ages of children should be established by the school health service.)

d) Academic work is poor. (Criteria should be established by the school according to its pattern of instruction and grading.)

7. Special effort should be made to obtain a test of hearing whenever a child has not entered school at the usual starting age.

When hearing impairment could be a contributing factor, no child should be denied admission or delayed in admission to school for supposed mental retardation or other

reason without attempting a test of hearing.

8. When a child fails a first screening test, the audiometric test should be repeated the same day, possibly with partial threshold testing in the middle frequencies. If he fails a second time:

a) His classroom teachers should be informed immediately of the possibility of hearing impairment.

b) A questionnaire on his earlier and recent hearing history should be filled out by the parents and child.

c) He should be given a threshold test covering frequencies 250-8,000 approximately 3 weeks afterwards, or later if respiratory infection is present.

9. When a child fails a threshold test:

a) The school health service should arrange to have him examined by an otologist.

b) He should be referred to the family physician or to the family's usual resource for medical care, and the parents should be given an interpretation of the audiometric test results and the otologist's findings.

c) Attempt should be made to send reports to the physician who treats the child.

d) Prompt and persistent follow-up steps should be taken by the school and the school health service to assure adequate care. Frequent threshold retesting may help to motivate the family toward medical care as well as to measure the child's progress.

The six children who had 50 decibels or more of loss retained this loss with minor fluctuations throughout the period of observation but never developed any other impairment sufficient to fail an audiometric test.

In the small group of five cases with the pattern of loss of hearing in the low plus high frequency ranges at the first failure of an audiometric test, the one ear that did not ultimately pass the test showed only slight loss of hearing

in the middle range frequency (table 12). Among the infrequent cases of initial loss of hearing in the low range only, one ear showed slight hearing deficit after 3 or more years.

It seems safe to conclude that if a child has or is likely to develop appreciable difficulty in hearing speech, this can usually be detected by audiometric testing of the middle frequency range only. Therefore, in sweep check screening tests time should not be spent on the low and

10. Once a child has been found to have hearing impairment:

a) He should be removed from the screening program and thereafter be given appropriate supervision and his hearing threshold should be tested as frequently as indicated by his clinical and academic progress.

b) Mild hearing impairment in a child becomes more handicapping when it is associated with some degree of mental retardation. Such a child should have as complete audiologic and psychological appraisal as possible so that an appropriate program can be planned for him.

c) Decision on modification of any child's education because of hearing impairment should first be based on his immediate needs rather than on the prognosis and thereafter

on careful observation and frequent reappraisal of the child rather than on the mere nature of his audiometric score. This works in two directions. On the one hand, mild loss of hearing on the audiogram with a clinical picture that usually bears a good prognosis does not preclude prompt aggressive treatment, possibly the temporary use of a hearing aid, and adaptations in the child's educational program. On the other hand, when the prognosis seems poor, definitive acceptance of that prognosis should be postponed and long-term educational and vocational plans should not be made until longitudinal observation and treatment for at least 2 years have permitted a more valid estimate of the ultimate outcome.

4. In a routine screening program limited to as few as three frequencies, it may be desirable and feasible to do a threshold test rather than a sweep check test. The threshold test might detect changes in a child's hearing in successive years even within the usual passing level, and it would establish for each child his own individual norm rather than pegging all children at the same norm.

With the use of antibiotics, otologists have been reporting the common occurrence of nonpurulent collections of fluid in the middle ear chambers, producing an initial drop in hearing of as little as 10 decibels. Prompt recognition of this relatively minor degree of impairment might lead to early and aggressive therapy and to prevention of permanent damage.

5. In the opposite direction to moving from a sweep check to a threshold test, there may be effective shortcuts to case finding. Comparative studies should be made on the use of a single frequency, such as 1,000, or of some sound other than a pure tone but composed primarily of the middle frequencies. Verbal tests need further analysis. These have been discussed by Lee Meyerson in *Hearing for Speech in Children: A Verbal Audiometric Test* (Supplementum 128 to *Acta Oto-Laryngologica* 1956).

6. Evaluation should be done of the case-finding effectiveness of the several special referral criteria suggested in this paper.

7. Time and cost studies of the various audiometric screening methods are essential to help determine the most practicable procedures for testing large numbers of children.

SUGGESTIONS FOR RESEARCH

A variety of audiometric screening methods deserve comparative studies.

1. The increment of new cases found by an annual retest should be studied in a school screening program in which such annual testing is done routinely.

2. The effects on meaningful case finding of narrowing the span of screening to the middle frequencies and to the younger ages, as here recommended, should be studied in additional school programs.

3. If the pure tone sweep check method is used, studies should be done on the advisability of moving the screening decibel level closer to

the so-called zero line in the middle frequency range. The greater artifact of ambient noise in the low frequency range has heretofore been the major deterrent to establishing a more rigid passing standard for audiometric tests.

Change in the passing standard would also be in keeping with the greater acuity of hearing that is normally present in young children. Audiometers have been calibrated to fit the hearing of adults, not children. The case-finding and prognostic value of a more rigid passing standard in the middle frequency range should be checked by comparative studies.

Table 12. Combinations of frequency ranges affected at time of first failure of an ear, according to middle range involvement at time of last test

[Frequencies arranged in rank order of total percentage with middle range loss]

| Frequency ranges affected at time of first failure | | Ears having middle range loss at last test | | | | | |
|--|------------------------------------|--|----------------------------|---------------|-----------------------|----------------------------|---------------|
| Combinations of ranges (1) | Number of ears ¹ (2) | Number | | | Percent of column (2) | | |
| | | Total (3) | Moderate and severe (4) | Slight (5) | Total (6) | Moderate and severe (7) | Slight (8) |
| Total..... | 135 | 28 | 15 | 13 | 20.7 | 11.1 | 9.6 |
| Middle and high..... | 21 | 12 | 9 | 3 | 57.1 | 42.9 | 14.2 |
| High only..... | 13 | 3 | ----- | 3 | 23.1 | ----- | 23.1 |
| Middle and low..... | 19 | 4 | 3 | 1 | 21.1 | 15.8 | 5.3 |
| Low and high..... | 5 | 1 | ----- | 1 | 20.0 | ----- | 20.0 |
| Low only..... | 8 | 1 | ----- | 1 | 12.5 | ----- | 12.5 |
| Middle, low, and high..... | 64 | 7 | 3 | 4 | 10.9 | 4.7 | 6.2 |
| Middle only..... | 5 | ----- | ----- | ----- | ----- | ----- | ----- |

¹ Number of ears with a 3-year span of test coverage after first failure. For observed differences in column (7), $\chi^2=18.76$ $P<.001$.

high frequency ranges. When, however, one moves from finding new cases by screening tests to assessing, treating, and educating children with known hearing impairment, knowledge concerning any associated impairment of hearing in the low and high frequencies is important. A number of findings indicate that low and high frequency ranges should be included when threshold tests are done on children with known or suspected loss of hearing.

The severity of end-point middle frequency range loss of hearing depended on early impairment of hearing in the middle frequency range in combination with 1 or 2 other frequency ranges (table 12) in the same rank order as the tendency of such combinations of ranges to persist (table 11), as follows: middle plus high, middle plus low, and middle plus high plus low.

Severity of Hearing Impairment

The mere presence at the time of first audiometric test failure of loss of hearing in either the low or high frequency range combined with impairment of hearing in the middle frequency range was more significant than the severity of early impairment in the low or high range. Among the ears with loss of hearing in the middle range plus high range at the first failure of an audiometric test, the group with

the highest proportion of persistence of hearing impairment (63.6 percent, table 11), there was no relationship between the severity of loss of hearing in the high range at the first test failure and loss of hearing in the middle range at the last test. There was, however, striking correlation between the severity of hearing impairment in the middle frequency range at the first and last tests.

Among the 19 ears with loss of hearing in the middle plus low frequency ranges at first failure of an audiometric test, the extent of first impairment of hearing in either the middle or low range had no relationship to whether an ear later passed or failed the audiometric test or to the severity of end-point middle frequency range loss of hearing when the ear did fail the test. Four ears showed audiometric test failure after the first test. In none of the rare instances of initial loss of hearing in the middle frequency range only was there any hearing impairment after a span of 3 or more years.

Of particular interest is the large group of ears that showed "across the board" loss of hearing in all three frequency ranges at the first failure of an audiometric test. Only 11 percent of these ears followed for 3 or more years had more than slight middle range loss at the last test. Even among 10 children who had severe

loss of hearing in all 3 frequency ranges at the first failure of an audiometric test, 9 finally passed the sweep check test. Therefore, among children attending day school, "across the board" loss of hearing on audiometric test usually is the result of acute rather than chronic hearing impairment.

In this study, loss of hearing in some of these children may have been due to impacted wax, although case histories indicated the frequent existence of nasopharyngeal infection. This finding is in keeping with the experience of clinicians that there is a general "flattening" of hearing level associated with acute middle ear infection and that this flattening moves either toward recovery or toward persistent loss of hearing of a less even nature. The broad span of frequencies affected in the flattening gives a favorable rather than an unfavorable prognosis as long as the impairment is not excessive.

The prognostic importance of "across the board" loss of hearing was borne out by a look at another group of children. This group was composed of seven children who were in the same age group as the study population and whose families resided in the Reading School District but who attended the State residential school for the deaf. All of these children had consistent "across the board" impairment of hearing from first to last tests, with much greater decibel loss than the children in the study. No child in the study population, for example, ever had an audiogram with every frequency reading at 60 decibels or more. Although severity and duration of "across the board" hearing impairment are of some assistance, it is not always possible to distinguish between the child whose hearing will clear up partially or completely and the child who will remain seriously handicapped. What is vital is the fact that the prognosis for many children with considerable hearing loss covering a wide spectrum of frequencies need not be a pessimistic one.

An attempt was made to derive prognostic significance from the greatest degree of hearing impairment in each frequency range in any ear during the study period. Continuity of failure of audiometric tests or intermittency of hearing impairment ending in failure of the

test correlated directly with increasing severity of the poorest test result in the middle frequency range. The correlation was even greater with poor test results in the high frequency range. On the other hand, the ears that remained normal in the low frequency range despite failing one or more audiometric tests had the poorest prognosis for chronicity of hearing impairment. Evidently, unevenness in audiometric test score is more indicative of probable persistence of hearing impairment than is "across the board" homogeneous severity of hearing loss. This applies not only to irregular impairment of hearing in the three frequency ranges but to uneven severity of hearing loss from one frequency to another within any range.

Laterality of Impairment

Some interesting prognostic inferences may be drawn from the data on consistency of hearing impairment of one or both ears in the same children. Among the 58 children who failed the audiometric test in more than 1 year, 38 percent had unilateral involvement only, 24 percent had bilateral involvement only, and 38 percent fluctuated between unilateral and bilateral involvement. In almost no instance did unilateral failure move from one ear to the other, and very rarely did hearing loss progress from unilateral to bilateral involvement. The change, if any, was usually in the other direction. In general, a better prognosis for hearing status at the last audiometric test was suggested when there was fluctuation between bilateral and unilateral hearing loss during a child's school career than if the loss was always unilateral or always bilateral (table 13).

At the end of the observation period, 13 children, or 8 per 1,000, had bilateral hearing loss of more than 30 decibels in the middle frequency range. Seven were in the school for the deaf; six were from the Reading School District biennial audiometric test program. These six children were the ones with a definite deficit for hearing speech. Four had had hearing difficulty when they entered school; two developed hearing difficulty later. In the entire study population, there was only one child who had had the same degree and type

Table 13. Number of children who failed more than one audiometric test and number and percentage of failures at time of last test, according to laterality of impairment in all test failures

| Laterality of ear involvement when failing tests | Children failing more than 1 test | Failed last test | |
|--|-----------------------------------|------------------|---------|
| | | Number | Percent |
| Total----- | 58 | 36 | 62.1 |
| Always unilateral----- | 22 | 17 | 77.3 |
| Always bilateral----- | 14 | 10 | 71.4 |
| Mixed laterality----- | 22 | 9 | 40.9 |

of hearing loss for 2 or more years but whose hearing at the last observation was no longer impaired to the same extent as at the beginning of the study. Information was not available on homebound children with other handicaps that could affect their hearing.

Summary

During an 8-year study of 1,726 school children aged 5-14 years in Reading, Pa., 116, or 6.7 percent, ever failed an audiometric test.

The increment of new cases of hearing impairment found by a biennial retest routine was 2.3 percent among "candidates" 8-9 years old, 1.0 percent in the group aged 10-11 years, and 0.8 percent in those 12-13 years old.

Among children 5-7 years of age who passed their first audiometric tests, 3.3 percent failed a subsequent test. Among children in this age group who failed their first audiometric test, 48.4 percent failed later tests. When children passed all their tests before 10 years of age, less than 1 percent failed thereafter.

Hearing impairment persisted without interruption in 28 percent of the children and in 24 percent of the ears that ever failed an audiometric test.

Young children whose hearing impairment was discovered about the time they entered school had more severe types of hearing impairment than other children, suggesting that the condition had probably existed for some time prior to admission to school.

Rates of delayed admission to school, delay in receiving audiometric tests, repetition of

academic grades, and retarded grade status at the end of the observation period were higher for children who ever failed an audiometric test than for other children. Moderate unilateral impairment of hearing as well as severe or bilateral loss of hearing seemed to constitute an educational handicap, especially during the early years of learning language, reading, and spelling, when missing parts of the sounds might almost completely prevent a child from grasping the meaning of what he hears.

Ultimate loss of hearing in the middle frequency range after failure of an audiometric test did not often occur unless there had been initial impairment of hearing in the middle frequency range. With initial middle frequency range loss of hearing alone, the prognosis was good; initial middle range plus low frequency range loss signified a poorer prognosis, and initial middle plus high frequency range loss, the least favorable prognosis.

Initial "across the board" loss of hearing in all three frequency ranges at 40 decibels or less usually denoted a good prognosis. More severe and early "across the board" impairment of hearing occurred in cases of persistent deafness.

Unevenness of audiograms in severity of hearing impairment and in frequency ranges gave a poorer prognosis than evenness except for the most severely affected ears.

Hearing impairment in 38 percent of the children who failed the audiometric test in more than one year was unilateral whenever they failed the tests, almost always in the same ear; in 24 percent, always bilateral; and in 38 percent, impairment fluctuated between unilateral and bilateral involvement. Such fluctuation gave a better prognosis than when hearing loss was always unilateral or always bilateral.

Eight children per 1,000 studied had an end point of bilateral hearing impairment of more than 30 decibels in the middle frequency range.

REFERENCE

- (1) Wishik, S. M., and Kramm, E. R.: Audiometric testing of hearing of school children. *J. Speech & Hearing Disorders* 18: 360-365, December 1953.

Milk Sanitation Honor Roll for 1956-57

Sixty-four communities have been added to the Public Health Service milk sanitation "honor roll," and 45 communities on the previous list have been dropped. This revision covers the period from January 1, 1956, to December 31, 1957, and includes a total of 266 cities and 70 counties.

Communities on the "honor roll" have complied substantially with the various items of sanitation contained in the milk ordinance suggested by the U. S. Public Health Service. The State milk sanitation authorities concerned report this compliance to the Public Health Service. The rating of 90 percent or more, which is necessary for inclusion on the list, is computed from the weighted average of the percentages of compliance. Separate lists are compiled for communities in which all market milk sold is pasteurized, and for those in which both raw milk and pasteurized milk is sold.

The suggested milk ordinance, on which the milk sanitation ratings are based, is now in effect through

This compilation is from the Division of Sanitary Engineering Services of the Bureau of State Services, Public Health Service. The previous listing, with a summary of rules under which a community is included, was published in Public Health Reports, October 1957, pp. 943-946. The rating method was described in Public Health Reports 53: 1386 (1938). Reprint No. 1970.

voluntary adoption in 477 counties and 1,398 municipalities. The ordinance also serves as the basis for the regulations of 34 States and 2 Territories. In 14 States and 2 Territories it is in effect statewide.

The ratings do not represent a complete measure of safety, but they do indicate how closely a community's milk supply conforms with the standards for grade A milk as

stated in the suggested ordinance. High-grade pasteurized milk is safer than high-grade raw milk because of the added protection of pasteurization. The second list, therefore, shows the percentage of pasteurized milk sold in a community which also permits the sale of raw milk.

Although semiannual publication of the list is intended to encourage communities operating under the suggested ordinance to attain and maintain a high level of enforcement of its provisions, no comparison is intended with communities operating under other milk ordinances. Some communities might be deserving of inclusion, but they cannot be listed because no arrangements have been made for determination of their ratings by the State milk sanitation authority concerned. In other cases, the ratings which were submitted have lapsed because they were more than 2 years old. Still other communities, some of which may have high-grade milk supplies, have indicated no desire for rating or inclusion on this list.

Communities awarded milk sanitation ratings of 90 percent or more, 1956-57

100 PERCENT OF MARKET MILK PASTEURIZED

| Community | Date of rating | Community | Date of rating | Community | Date of rating |
|-----------------------------|----------------|------------------------|----------------|--------------------------|----------------|
| <i>Arizona</i> | | <i>Georgia</i> | | <i>Georgia—Continued</i> | |
| Graham County..... | 10-16-1956 | Albany..... | 11-22-1957 | Dalton-Whitfield | |
| Phoenix..... | 2-1957 | Athens-Clarke County.. | 4-2-1957 | County..... | 5-21-1957 |
| <i>Colorado</i> | | Atlanta..... | 8-23-1957 | Douglas..... | 6-14-1956 |
| Boulder County..... | 12-14-1956 | Augusta-Richmond | | Griffin..... | 11-14-1957 |
| Colorado Springs..... | 1-19-1956 | County..... | 11-9-1956 | La Grange..... | 12-20-1956 |
| Denver..... | 8-27-1957 | Bainbridge..... | 1-19-1956 | Moultrie..... | 5-22-1957 |
| Pueblo County..... | 2-2-1956 | Bayley..... | 8-14-1956 | Quitman..... | 5-8-1957 |
| <i>District of Columbia</i> | | Calhoun-Gordon | | Savannah-Chatham | |
| Washington..... | 3-12-1956 | County..... | 9-7-1956 | County..... | 9-25-1956 |
| | | Cartersville..... | 1-30-1957 | Statesboro-Bulloch | |
| | | Columbus..... | 1-18-1957 | County..... | 3-27-1957 |

Table 13. Number of children who failed more than one audiometric test and number and percentage of failures at time of last test, according to laterality of impairment in all test failures

| Laterality of ear involvement when failing tests | Children failing more than 1 test | Failed last test | |
|--|-----------------------------------|------------------|---------|
| | | Number | Percent |
| Total..... | 58 | 36 | 62.1 |
| Always unilateral..... | 22 | 17 | 77.3 |
| Always bilateral..... | 14 | 10 | 71.4 |
| Mixed laterality..... | 22 | 9 | 40.9 |

of hearing loss for 2 or more years but whose hearing at the last observation was no longer impaired to the same extent as at the beginning of the study. Information was not available on homebound children with other handicaps that could affect their hearing.

Summary

During an 8-year study of 1,726 school children aged 5-14 years in Reading, Pa., 116, or 6.7 percent, ever failed an audiometric test.

The increment of new cases of hearing impairment found by a biennial retest routine was 2.3 percent among "candidates" 8-9 years old, 1.0 percent in the group aged 10-11 years, and 0.8 percent in those 12-13 years old.

Among children 5-7 years of age who passed their first audiometric tests, 3.3 percent failed a subsequent test. Among children in this age group who failed their first audiometric test, 48.4 percent failed later tests. When children passed all their tests before 10 years of age, less than 1 percent failed thereafter.

Hearing impairment persisted without interruption in 28 percent of the children and in 24 percent of the ears that ever failed an audiometric test.

Young children whose hearing impairment was discovered about the time they entered school had more severe types of hearing impairment than other children, suggesting that the condition had probably existed for some time prior to admission to school.

Rates of delayed admission to school, delay in receiving audiometric tests, repetition of

academic grades, and retarded grade status at the end of the observation period were higher for children who ever failed an audiometric test than for other children. Moderate unilateral impairment of hearing as well as severe or bilateral loss of hearing seemed to constitute an educational handicap, especially during the early years of learning language, reading, and spelling, when missing parts of the sounds might almost completely prevent a child from grasping the meaning of what he hears.

Ultimate loss of hearing in the middle frequency range after failure of an audiometric test did not often occur unless there had been initial impairment of hearing in the middle frequency range. With initial middle frequency range loss of hearing alone, the prognosis was good; initial middle range plus low frequency range loss signified a poorer prognosis, and initial middle plus high frequency range loss, the least favorable prognosis.

Initial "across the board" loss of hearing in all three frequency ranges at 40 decibels or less usually denoted a good prognosis. More severe and early "across the board" impairment of hearing occurred in cases of persistent deafness.

Unevenness of audiograms in severity of hearing impairment and in frequency ranges gave a poorer prognosis than evenness except for the most severely affected ears.

Hearing impairment in 38 percent of the children who failed the audiometric test in more than one year was unilateral whenever they failed the tests, almost always in the same ear; in 24 percent, always bilateral; and in 38 percent, impairment fluctuated between unilateral and bilateral involvement. Such fluctuation gave a better prognosis than when hearing loss was always unilateral or always bilateral.

Eight children per 1,000 studied had an end point of bilateral hearing impairment of more than 30 decibels in the middle frequency range.

REFERENCE

- (1) Wishik, S. M., and Kraum, E. R.: Audiometric testing of hearing of school children. *J. Speech & Hearing Disorders* 18: 360-365, December 1953.

Milk Sanitation Honor Roll for 1956-57

Sixty-four communities have been added to the Public Health Service milk sanitation "honor roll," and 45 communities on the previous list have been dropped. This revision covers the period from January 1, 1956, to December 31, 1957, and includes a total of 266 cities and 70 counties.

Communities on the "honor roll" have complied substantially with the various items of sanitation contained in the milk ordinance suggested by the U. S. Public Health Service. The State milk sanitation authorities concerned report this compliance to the Public Health Service. The rating of 90 percent or more, which is necessary for inclusion on the list, is computed from the weighted average of the percentages of compliance. Separate lists are compiled for communities in which all market milk sold is pasteurized, and for those in which both raw milk and pasteurized milk is sold.

The suggested milk ordinance, on which the milk sanitation ratings are based, is now in effect through

This compilation is from the Division of Sanitary Engineering Services of the Bureau of State Services, Public Health Service. The previous listing, with a summary of rules under which a community is included, was published in Public Health Reports, October 1957, pp. 943-946. The rating method was described in Public Health Reports 53: 1386 (1938). Reprint No. 1970.

voluntary adoption in 477 counties and 1,398 municipalities. The ordinance also serves as the basis for the regulations of 34 States and 2 Territories. In 14 States and 2 Territories it is in effect statewide.

The ratings do not represent a complete measure of safety, but they do indicate how closely a community's milk supply conforms with the standards for grade A milk as

stated in the suggested ordinance. High-grade pasteurized milk is safer than high-grade raw milk because of the added protection of pasteurization. The second list, therefore, shows the percentage of pasteurized milk sold in a community which also permits the sale of raw milk.

Although semiannual publication of the list is intended to encourage communities operating under the suggested ordinance to attain and maintain a high level of enforcement of its provisions, no comparison is intended with communities operating under other milk ordinances. Some communities might be deserving of inclusion, but they cannot be listed because no arrangements have been made for determination of their ratings by the State milk sanitation authority concerned. In other cases, the ratings which were submitted have lapsed because they were more than 2 years old. Still other communities, some of which may have high-grade milk supplies, have indicated no desire for rating or inclusion on this list.

Communities awarded milk sanitation ratings of 90 percent or more, 1956-57

100 PERCENT OF MARKET MILK PASTEURIZED

| Community | Date of rating | Community | Date of rating | Community | Date of rating |
|-----------------------------|----------------|------------------------|----------------|--------------------------|----------------|
| <i>Arizona</i> | | <i>Georgia</i> | | <i>Georgia—Continued</i> | |
| Graham County..... | 10-16-1956 | Albany..... | 11-22-1957 | Dalton-Whitfield | |
| Phoenix..... | 2-1957 | Athens-Clarke County.. | 4-2-1957 | County..... | 5-21-1957 |
| <i>Colorado</i> | | Atlanta..... | 8-23-1957 | Douglas..... | 6-14-1956 |
| Boulder County..... | 12-14-1956 | Augusta-Richmond | | Griffin..... | 11-14-1957 |
| Colorado Springs..... | 1-19-1956 | County..... | 11-9-1956 | La Grange..... | 12-20-1956 |
| Denver..... | 8-27-1957 | Bainbridge..... | 1-19-1956 | Moultrie..... | 5-22-1957 |
| Pueblo County..... | 2-2-1956 | Baxley..... | 8-14-1956 | Quitman..... | 5-8-1957 |
| <i>District of Columbia</i> | | Calhoun-Gordon | | Savannah-Chatham | |
| Washington..... | 3-12-1956 | County..... | 9-7-1956 | County..... | 9-25-1956 |
| | | Cartersville..... | 1-30-1957 | Statesboro-Bullock | |
| | | Columbus..... | 1-18-1957 | County..... | 3-27-1957 |

Communities awarded milk sanitation ratings of 90 percent or more, 1956-57—Continued

100 PERCENT OF MARKET MILK PASTEURIZED—Continued

| <i>Community</i> | <i>Date of rating</i> | <i>Community</i> | <i>Date of rating</i> | <i>Community</i> | <i>Date of rating</i> |
|--------------------------|-----------------------|--------------------------|-----------------------|---------------------------|-----------------------|
| <i>Georgia—Continued</i> | | <i>Indiana—Continued</i> | | <i>Kentucky—Continued</i> | |
| Valdosta..... | 4-18-1956 | Vincennes..... | 10- 3-1957 | Trigg County..... | 10- 5-1956 |
| Waycross..... | 8-30-1956 | Warsaw..... | 11-16-1956 | Union County..... | 5- 7-1956 |
| | | Winchester..... | 5- 7-1952 | | |
| <i>Idaho</i> | | <i>Kentucky</i> | | <i>Mississippi</i> | |
| Idaho Falls..... | 6-13-1956 | Anderson County..... | 5-17-1956 | Booneville..... | 8-28-1957 |
| | | Barbourville..... | 11-28-1956 | Canton..... | 11-14-1956 |
| <i>Illinois</i> | | Bardstown-Nelson | | Clarksdale..... | 1- 9-1957 |
| Chicago..... | 6-13-1957 | County..... | 5-21-1957 | Columbus..... | 9-19-1956 |
| Evanston..... | 3-13-1957 | Bell County..... | 4-19-1957 | Corinth..... | 7- 9-1957 |
| North Shore municipal- | | Benton..... | 6- 7-1956 | Eupora..... | 2-23-1956 |
| ities..... | 3-20-1957 | Bowling Green-Warren | | Greenwood..... | 4-25-1956 |
| Glencoe..... | | County..... | 7-22-1957 | Grenada..... | 9-21-1957 |
| Highland Park..... | | Brandenburg..... | 4-11-1957 | Hernando..... | 1- 7-1957 |
| Kenilworth..... | | Breckinridge County... | 5-31-1956 | Houston..... | 6-26-1957 |
| Lake Bluff..... | | Cadiz..... | 10- 5-1956 | Iuka..... | 7-11-1957 |
| Lake Forest..... | | Campbellsville..... | 4- 5-1957 | Laurel..... | 7-12 1956 |
| Northbrook..... | | Covington..... | 6-13-1957 | Louisville..... | 11-23-1956 |
| Wilmette..... | | Eddyville..... | 6- 5-1956 | McComb..... | 8- 2-1956 |
| Winnetka..... | | Falmouth..... | 4-26-1956 | Meadville..... | 3- 7-1957 |
| Oak Park..... | 3- 6-1957 | Frankfort..... | 10-18-1957 | Meridian..... | 6-18-1956 |
| | | Georgetown..... | 10-16-1956 | Morton..... | 7-24-1956 |
| <i>Indiana</i> | | Greenville..... | 6- 6-1956 | New Albany..... | 1-18-1956 |
| Anderson..... | 5-22-1957 | Hardinsburg..... | 5-31-1956 | Oxford..... | 8-27-1957 |
| Berne, Bluffton, Warren | | Harrodsburg..... | 2-20-1957 | Starkville..... | 3-13-1957 |
| area..... | 1-17-1957 | Hodgensville..... | 2-14-1957 | State College..... | 3-13-1957 |
| Calumet region..... | 4-24-1957 | Hopkinsville-Christian | | Tupelo..... | 4- 9-1957 |
| East Chicago..... | | County..... | 9-26-1957 | | |
| Gary..... | | Lawrenceburg..... | 5-17-1956 | <i>Missouri</i> | |
| Hammond..... | | Leitchfield-Grayson | | Cape Girardeau..... | 7-12-1956 |
| Columbia City..... | 6-26-1957 | County..... | 10-10-1957 | Chillicothe..... | 3- 5-1957 |
| Elkhart, Goshen, Nap- | | Liberty..... | 10-11-1956 | Fulton..... | 3- 7-1956 |
| pance area..... | 1-11-1956 | Louisville-Jefferson | | Kansas City..... | 8-17-1956 |
| Evansville..... | 12-20-1956 | County..... | 4-19-1956 | St. Joseph..... | 6-14-1957 |
| Frankfort..... | 6-10-1957 | Mayfield-Graves | | St. Louis County..... | 3-28-1956 |
| Greencastle..... | 1- 4-1956 | County..... | 8- 2-1957 | Sedalia..... | 8- 7-1957 |
| Indianapolis-Marion | | Maysville..... | 7-23-1957 | Springfield..... | 10-26-1956 |
| County..... | 8-13-1956 | Monticello..... | 7-20-1956 | | |
| Kokomo..... | 2-19-1957 | Morgantown..... | 6- 5-1956 | <i>Nevada</i> | |
| Lafayette..... | 9- 7-1956 | Murray..... | 3-16-1956 | Clark, Lincoln, and Nye | |
| Lake County..... | 3-25-1957 | Newport-Campbell | | Counties..... | 5- 1-1957 |
| La Porte..... | 5-25-1956 | County..... | 10-18-1957 | | |
| Muncie..... | 11-30-1956 | Owensboro..... | 5-17-1956 | <i>New Mexico</i> | |
| New Castle..... | 9-28-1956 | Paducah..... | 7-31-1957 | Albuquerque..... | 10-26-1956 |
| North Manchester..... | 7- 3-1957 | Paris-Bourbon County.. | 5- 3-1956 | Portales..... | 9-28-1956 |
| Peru..... | 4-10-1957 | Russellville..... | 11- 7-1956 | | |
| Richmond..... | 4-24-1957 | Smithland..... | 6- 6-1956 | <i>North Carolina</i> | |
| Rochester..... | 12-19-1956 | Spencer County..... | 6- 1-1956 | Alamance County..... | 3-15-1957 |
| Salem..... | 6-28-1956 | | | Beaufort County..... | 5-22-1957 |
| South Bend..... | 3- 8-1956 | | | Camden County..... | 7- 5-1956 |
| Union City..... | 7- 3-1957 | | | Charlotte..... | 3- 7-1956 |

Communities awarded milk sanitation ratings of 90 percent or more, 1956-57—Continued

100 PERCENT OF MARKET MILK PASTEURIZED—Continued

| <i>Community</i> | <i>Date of rating</i> | <i>Community</i> | <i>Date of rating</i> | <i>Community</i> | <i>Date of rating</i> |
|---------------------------------|-----------------------|----------------------------|-----------------------|---------------------|-----------------------|
| <i>North Carolina—Continued</i> | | <i>Tennessee—Continued</i> | | <i>Utah</i> | |
| Chatham County..... | 8-13-1957 | Decherd..... | 11-20-1956 | Logan..... | 5- 4-1956 |
| Chowan County..... | 7- 5-1956 | Dyersburg..... | 11-14-1956 | Salt Lake City..... | 2-10-1956 |
| Craven County..... | 8-30-1957 | Fayetteville..... | 6- 7-1956 | | |
| Cumberland County... | 3-16-1956 | Franklin..... | 5- 3-1956 | <i>Virginia</i> | |
| Durham County..... | 8- 7-1956 | Greeneville..... | 6-19-1956 | Alexandria..... | 6-28-1957 |
| Edgecombe County..... | 10- 5-1956 | Humboldt..... | 6-19-1956 | Blacksburg..... | 8-16-1956 |
| Forsyth County..... | 2-22-1957 | Huntingdon..... | 10-29-1956 | Bristol..... | 11- 7-1957 |
| Guilford County..... | 9-26-1956 | Jackson..... | 6-20-1956 | Christiansburg..... | 8-16-1956 |
| Halifax County..... | 9-13-1957 | Jefferson City..... | 8-20-1956 | Franklin..... | 6- 7-1957 |
| Jackson County..... | 12-12-1956 | Knoxville-Knox | | Marion..... | 11-29-1956 |
| Lee County..... | 3- 7-1957 | County..... | 9-25-1957 | Norfolk..... | 6- 1-1956 |
| Lenoir County..... | 2- 4-1957 | Livingston..... | 6- 8-1956 | Portsmouth..... | 3- 7-1957 |
| Macon County..... | 12-12-1956 | Loudon..... | 5-24-1956 | Pulaski..... | 8-17-1956 |
| Montgomery County... | 10-22-1956 | Manchester..... | 10-12-1956 | Radford..... | 8-15-1956 |
| Nash County..... | 1-17-1957 | Memphis..... | 7-11-1957 | Richmond..... | 4- 6-1956 |
| New Hanover County... | 5-24-1956 | Milan..... | 6-19-1956 | Roanoke..... | 6- 1-1956 |
| Northampton County... | 9- 6-1956 | Morristown..... | 8-20-1956 | South Boston..... | 4-13-1956 |
| Onslow County..... | 5-20-1957 | Murfreesboro..... | 8-14-1957 | Staunton..... | 4-27-1956 |
| Orange County..... | 8-13-1957 | Nashville-Davidson | | Suffolk..... | 6- 6-1957 |
| Pamlico County..... | 5-24-1957 | County..... | 10-28-1957 | Waynesboro..... | 12- 5-1957 |
| Pasquotank County.... | 7- 5-1956 | Newbern..... | 11-14-1956 | | |
| Perquimans County.... | 7- 5-1956 | Paris..... | 11-17-1956 | <i>Washington</i> | |
| Person County..... | 8-13-1957 | Shelbyville..... | 5-17-1956 | Spokane..... | 10-24-1956 |
| Rowan County..... | 6-28-1957 | Sparta..... | 5-16-1956 | Whitman County..... | 11- 8-1956 |
| Sampson County..... | 8-27-1956 | Sweetwater..... | 11-27-1956 | | |
| Scotland County..... | 5-30-1956 | Tulahoma..... | 10- 9-1956 | <i>Wisconsin</i> | |
| Stanly County..... | 12-11-1956 | Winchester..... | 11-20-1956 | Appleton..... | 1-10-1957 |
| Swain County..... | 12-12-1956 | | | Ashland..... | 10-10-1956 |
| | | <i>Texas</i> | | Beaver Dam..... | 2- 6-1957 |
| | | Brady..... | 6-26-1957 | Burlington..... | 10-24-1956 |
| | | Brownwood..... | 6-21-1957 | Delavan..... | 10-24-1956 |
| | | Cleburne..... | 3-13-1956 | Dodgeville..... | 5-21-1956 |
| | | Dallas..... | 10-19-1956 | Eau Claire..... | 2- 7-1957 |
| | | Falfurrias..... | 6-22-1956 | Elkhorn..... | 10-24-1956 |
| | | Gladewater..... | 2-19-1957 | Fontana..... | 10-24-1956 |
| | | Gonzales..... | 6-21-1957 | Fort Atkinson..... | 10-24-1956 |
| | | Harlingen..... | 6-14-1956 | Green Bay..... | 10-11-1957 |
| | | Houston..... | 5-24-1956 | Kenosha..... | 7- 5-1957 |
| | | Jacksonville..... | 6- 7-1956 | La Crosse..... | 1-29-1957 |
| | | Kerrville..... | 4-11-1957 | Lake Geneva..... | 10-24-1956 |
| | | Kilgore..... | 2-19-1957 | Manitowoc..... | 4-12-1957 |
| | | Mineral Wells..... | 6-21-1957 | Milwaukee..... | 6- 8-1956 |
| | | New Brannfels..... | 1-31-1957 | Oshkosh..... | 7-11-1956 |
| | | Plainview..... | 6- 2-1956 | Racine..... | 7-12-1956 |
| | | San Angelo..... | 8- 8-1957 | Ripon..... | 2- 6-1957 |
| | | San Antonio..... | 4- 1-1957 | Sheboygan..... | 7-26-1957 |
| | | San Benito..... | 6-14-1956 | Walworth..... | 10-24-1956 |
| | | Texarkana..... | 3- 9-1956 | Waupun..... | 2- 6-1957 |
| | | Tyler..... | 3- 5-1957 | Williams Bay..... | 10-24-1956 |
| | | Vernon..... | 6-21-1957 | | |
| | | Wichita Falls..... | 2-19-1957 | | |
| <i>Ohio</i> | | | | | |
| Lima..... | 10- 1-1957 | | | | |
| <i>Oklahoma</i> | | | | | |
| Ardmore..... | 4-13-1956 | | | | |
| Bartlesville..... | 2-26-1957 | | | | |
| Guthrie..... | 5-22-1956 | | | | |
| Okmulgee..... | 5- 8-1956 | | | | |
| Sulphur..... | 2- 9-1956 | | | | |
| Tahlequah..... | 5- 1-1956 | | | | |
| Tulsa..... | 6-21-1957 | | | | |
| <i>Tennessee</i> | | | | | |
| Bristol..... | 11- 7-1957 | | | | |
| Chattanooga..... | 11-20-1956 | | | | |
| Clinton..... | 5-29-1956 | | | | |
| Columbia..... | 6- 7-1956 | | | | |
| Cookeville..... | 10- 2-1957 | | | | |
| Copperhill..... | 11-27-1956 | | | | |
| Cowan..... | 11-20-1956 | | | | |

Communities awarded milk sanitation ratings of 90 percent or more, 1956-57—Continued

100 PERCENT OF MARKET MILK PASTEURIZED—Continued

| <i>Community</i> | <i>Date of rating</i> | <i>Community</i> | <i>Date of rating</i> | <i>Community</i> | <i>Date of rating</i> |
|--------------------------|-----------------------|--------------------------|-----------------------|---------------------------|-----------------------|
| <i>Georgia—Continued</i> | | <i>Indiana—Continued</i> | | <i>Kentucky—Continued</i> | |
| Valdosta..... | 4-18-1956 | Vincennes..... | 10- 3-1957 | Trigg County..... | 10- 5-1956 |
| Waycross..... | 8-30-1956 | Warsaw..... | 11-16-1956 | Union County..... | 5- 7-1956 |
| <i>Idaho</i> | | <i>Kentucky</i> | | <i>Mississippi</i> | |
| Idaho Falls..... | 6-13-1956 | Anderson County..... | 5-17-1956 | Booneville..... | 8-28-1957 |
| <i>Illinois</i> | | Barbourville..... | 11-28-1956 | Canton..... | 11-14-1956 |
| Chicago..... | 6-13-1957 | Bardstown-Nelson | | Clarksdale..... | 1- 9-1957 |
| Evanston..... | 3-13-1957 | County..... | 5-21-1957 | Columbus..... | 9-19-1956 |
| North Shore municipal- | | Bell County..... | 4-19-1957 | Corinth..... | 7- 9-1957 |
| ities..... | 3-20-1957 | Benton..... | 6- 7-1956 | Eupora..... | 2-23-1956 |
| Glencoe..... | | Bowling Green-Warren | | Greenwood..... | 4-25-1956 |
| Highland Park..... | | County..... | 7-22-1957 | Grenada..... | 9-24-1957 |
| Kenilworth..... | | Brandenburg..... | 4-11-1957 | Hernando..... | 1- 7-1957 |
| Lake Bluff..... | | Breekinridge County... | 5-31-1956 | Houston..... | 6-26-1957 |
| Lake Forest..... | | Cadiz..... | 10- 5-1956 | Iuka..... | 7-11-1957 |
| Northbrook..... | | Campbellsville..... | 4- 5-1957 | Laurel..... | 7-12 1956 |
| Wilmette..... | | Covington..... | 6-13-1957 | Louisville..... | 11-23-1956 |
| Winnetka..... | | Eddyville..... | 6- 5-1956 | McComb..... | 8- 2-1956 |
| Oak Park..... | 3- 6-1957 | Falmouth..... | 4-26-1956 | Meadville..... | 3- 7-1957 |
| <i>Indiana</i> | | Frankfort..... | 10-18-1957 | Meridian..... | 6-18-1956 |
| Anderson..... | 5-22-1957 | Georgetown..... | 10-16-1956 | Morton..... | 7-24-1956 |
| Berne, Bluffton, Warren | | Greenville..... | 6- 6-1956 | New Albany..... | 1-18-1956 |
| area..... | 1-17-1957 | Hardinsburg..... | 5-31-1956 | Oxford..... | 8-27-1957 |
| Calumet region..... | 4-24-1957 | Harrodsburg..... | 2-20-1957 | Starkville..... | 3-13-1957 |
| East Chicago..... | | Hodgensville..... | 2-14-1957 | State College..... | 3-13-1957 |
| Gary..... | | Hopkinsville-Christian | | Tupelo..... | 4- 9-1957 |
| Hammond..... | | County..... | 9-26-1957 | <i>Missouri</i> | |
| Columbia City..... | 6-26-1957 | Lawrenceburg..... | 5-17-1956 | Cape Girardeau..... | 7-12-1956 |
| Elkhart, Goshen, Nap- | | Leitchfield-Grayson | | Chilllicothe..... | 3- 5-1957 |
| panee area..... | 1-11-1956 | County..... | 10-10-1957 | Fulton..... | 3- 7-1956 |
| Evansville..... | 12-20-1956 | Liberty..... | 10-11-1956 | Kansas City..... | 8-17-1956 |
| Frankfort..... | 6-10-1957 | Louisville-Jefferson | | St. Joseph..... | 6-14-1957 |
| Greencastle..... | 1- 4-1956 | County..... | 4-19-1956 | St. Louis County..... | 3-28-1956 |
| Indianapolis-Marion | | Mayfield-Graves | | Sedalia..... | 8- 7-1957 |
| County..... | 8-13-1956 | County..... | 8- 2-1957 | Springfield..... | 10-26-1956 |
| Kokomo..... | 2-19-1957 | Maysville..... | 7-23-1957 | <i>Nevada</i> | |
| Lafayette..... | 9- 7-1956 | Monticello..... | 7-20-1956 | Clark, Lincoln, and Nye | |
| Lake County..... | 3-25-1957 | Morgantown..... | 6- 5-1956 | Counties..... | 5- 1-1957 |
| La Porte..... | 5-25-1956 | Murray..... | 3-16-1956 | <i>New Mexico</i> | |
| Muncie..... | 11-30-1956 | Newport-Campbell | | Albuquerque..... | 10-26-1956 |
| New Castle..... | 9-28-1956 | County..... | 10-18-1957 | Portales..... | 9-28-1956 |
| North Manchester..... | 7- 3-1957 | Owensboro..... | 5-17-1956 | <i>North Carolina</i> | |
| Peru..... | 4-10-1957 | Paducah..... | 7-31-1957 | Alamance County..... | 3-15-1957 |
| Richmond..... | 4-24-1957 | Paris-Bourbon County... | 5- 3-1956 | Beaufort County..... | 5-22-1957 |
| Rochester..... | 12-19-1956 | Russellville..... | 11- 7-1956 | Camden County..... | 7- 5-1956 |
| Salem..... | 6-28-1956 | Smithland..... | 6- 6-1956 | Charlotte..... | 5- 7-1956 |
| South Bend..... | 3- 8-1956 | Spencer County..... | 6- 1-1956 | | |
| Union City..... | 7- 3-1957 | | | | |

Availability of Older People

Older persons has been a considerable interest in recent years. The interest has centered on the attitudes of society toward employment and retirement. It is given to the extent to which older people themselves are physically able to enter the

labor force. The questions in the third and fourth sections were asked alternatively of persons who were or were not in the labor force. These sections included questions on present or previous occupation, attitudes toward employment and retirement of older persons, and, for unemployed persons, conditions

the study reported upon in this monograph:

1. The individual's subjective assessment of his health and fitness for work.
2. A scale for measuring his degree of interest in entry into the labor force, and the degree of job opportunity existed.
3. How health, attitudes, family and other factors are related to entry or reentry into the labor

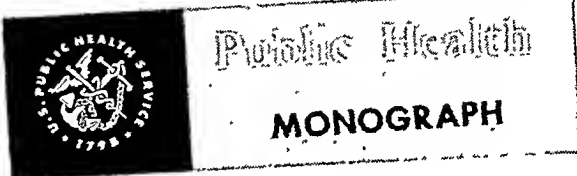
force. The study was considered to be equally as valid as the data derived from the study.

The study therefore emphasizes the methods used, the procedural difficulties encountered, and the limitations that were made, so that other workers interested in obtaining information on the availability for work among older persons might profit from this experience.

The study was conducted in Hagerstown, Md., in a sample of 1,114 dwelling units, 615 of which had one or more persons 45 years of age or over.

An interview was conducted with only one of these older persons at each household. The sampling plan devised for the survey is similar to the use of many communities for labor force or employment surveys as well as for other purposes. This sampling method has been described by Woolsey in Public Health Monograph No. 40.

The questionnaire contained four sections. The first was used to obtain basic household and personal data, the second, to obtain information



No. 51

The accompanying summary covers the principal findings presented in Public Health Monograph No. 51, published concurrently with this issue of Public Health Reports. The author is with the Division of Public Health Methods, Public Health Service.

Readers wishing the report in full may purchase copies of the monograph from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Inquiries Branch of the Public Health Service. Copies will be found also in the libraries of professional schools and of the major universities and in selected public libraries.

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Lawrence, Philip S.: Availability for work: Chronic disease and limitation of activity. Public Health Monograph No. 51 (PHS Pub. No. 556). 44 pages. U. S. Government Printing Office, Washington, D. C., 1958. Price 35 cents.

Communities awarded milk sanitation ratings of 90 percent or more, 1956-57—Continued

BOTH RAW AND PASTEURIZED MARKET MILK

| <i>Community and percent of milk pasteurized</i> | <i>Date of rating</i> | <i>Community and percent of milk pasteurized</i> | <i>Date of rating</i> | <i>Community and percent of milk pasteurized</i> | <i>Date of rating</i> |
|--|-----------------------|--|-----------------------|--|-----------------------|
| <i>Georgia</i> | | <i>North Carolina</i> | | <i>Texas—Continued</i> | |
| Cedartown, 96.9----- | 8-31-1957 | Cleveland County, 89.9_ | 9-10-1956 | Fort Worth, 99.98----- | 6-11-1957 |
| Fitzgerald, 97.9----- | 4-11-1957 | Gaston County, 97.9--- | 7-19-1957 | Longview, 99----- | 2-20-1957 |
| Marietta, 97.8----- | 10-26-1956 | <i>Oklahoma</i> | | Lubbock, 99.4----- | 6-14-1956 |
| Newnan, 95----- | 5- 3-1956 | | | Marshall, 98----- | 1- 4-1957 |
| Rome, 99.1----- | 10-16-1957 | Elk City, 99----- | 4-30-1956 | Palestine, 99.2----- | 10- 2-1957 |
| Thomaston, 91.5----- | 5- 3-1956 | Henryetta, 80.7----- | 4-17-1956 | Paris, 99----- | 1-23-1957 |
| Washington, 99.8----- | 3- 1-1957 | McAlester, 84----- | 7-18-1956 | Waco, 99.76----- | 3-19-1956 |
| Winder, 99----- | 3- 7-1957 | Norman, 99----- | 1-16-1956 | <i>Virginia</i> | |
| <i>Idaho</i> | | Oklahoma City, 98---- | 11- 9-1956 | | |
| Ada County, 96----- | 1-11-1957 | Ponca City, 96.6----- | 4-18-1956 | Charlottesville, 99.6---- | 9-27-1957 |
| <i>Kentucky</i> | | <i>Tennessee</i> | | <i>Washington</i> | |
| Lexington-Fayette | | McMinnville, 98.3----- | 5-15-1956 | Seattle-King County, | |
| County, 99----- | 9-13-1956 | <i>Texas</i> | | 99.7----- | 4- 9-1957 |
| Madisonville, 99----- | 1-25-1957 | Abilene, 90----- | 10-10-1957 | <i>West Virginia</i> | |
| Princeton, 96.5----- | 2-21-1957 | Austin, 99.4----- | 1-28-1957 | Kauawha County, 99-- | 11-20-1956 |
| Somerset, 95----- | 1-10-1957 | Brenham, 94----- | 6-13-1956 | Monongalia County, | |
| <i>Missouri</i> | | Brownsville, 98.3----- | 6-28-1956 | 97.8----- | 8- 9-1957 |
| Joplin, 97----- | 12-13-1956 | | | | |

NOTE: In these communities the pasteurized market milk shows a 90 percent or more compliance with the grade A pasteurized milk requirements, and the raw market milk shows a 90 percent or more compli-

ance with the grade A raw milk requirements, of the milk ordinance suggested by the United States Public Health Service.

Note particularly the percentage of the milk pasteurized in the vari-

ous communities listed. This percentage is an important factor to consider in estimating the safety of a city's milk supply. All milk should be pasteurized, either commercially or at home, before it is consumed.

Radiation Detection Through Hair-Root Changes

The amount of radiation a person has received may be measured by examining the hairs from his scalp if his head has been exposed, according to Dr. E. J. Scott and Dr. R. P. Reinertson of the National Cancer Institute, Public Health Service, who reported their findings in the September issue of the *Journal of Investigative Dermatology*.

The paper, "Detection of Radiation Effects on Hair Roots of the Human Scalp," describes a study of the hair roots of cancer patients undergoing radiation therapy at the National Cancer Institute.

As early as 4 days following radiation, abnormal changes, such as progressive thinning of the hair roots, were observed.

Employment Availability of Older People

EMPLOYMENT of older persons has been a subject of considerable interest in recent years. Much of this interest has centered on employment practices and the attitudes of society with respect to employment and retirement. Less attention has been given to the extent to which unemployed older people themselves are willing and are also physically able to enter the labor force.

The purposes of the study reported upon in this monograph were:

- To measure the individual's subjective assessment of his health and fitness for work.
- To devise a scale for measuring his degree of availability for entry into the labor force, assuming a suitable job opportunity existed.
- To determine how health, attitudes, family composition, and other factors are related to availability for entry or reentry into the labor force.

Methodology was considered to be equally as important as the data derived from the study. The report therefore emphasizes the methods employed, procedural difficulties encountered, and errors that were made, so that other communities interested in obtaining information on health or availability for work among older people might profit from this experience.

The study was conducted in Hagerstown, Md., in a sample of 1,114 dwelling units, 615 of which included one or more persons 45 years of age or older. An interview was conducted with only one of these older persons at each household. The sampling plan devised for the survey is adaptable to the use of many communities for health or employment surveys as well as for other purposes. This sampling method has been described by Woolsey in Public Health Monograph No. 40.

The questionnaire contained four sections. The first was used to obtain basic household and individual data, the second, to obtain information

on the health and limitations of the older person selected for interview. The questions in the third and fourth sections were asked alternatively of persons who were or were not in the labor force. These sections included questions on present or previous occupation, attitudes toward employment and retirement of older persons, and, for unemployed persons, conditions



Public Health

MONOGRAPH

No. 51

The accompanying summary covers the principal findings presented in Public Health Monograph No. 51, published concurrently with this issue of Public Health Reports. The author is with the Division of Public Health Methods, Public Health Service.

Readers wishing the report in full may purchase copies of the monograph from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Inquiries Branch of the Public Health Service. Copies will be found also in the libraries of professional schools and of the major universities and in selected public libraries.

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Lawrence, Philip S.: Availability for work: Chronic disease and limitation of activity. Public Health Monograph No. 51 (PHS Pub. No. 556). 44 pages. U. S. Government Printing Office, Washington, D. C., 1958. Price 35 cents.

under which they would be willing or able to accept employment. Although the questionnaire was pretested and modified, a number of problems in the design of the schedule and wording of the questions became evident when the final form was used in the field. These problems are discussed in detail in the monograph.

Availability for Work

Comparisons between people over age 45 years who are in the labor force and those who are not reveal differences with respect to health, physical limitations, education, marital status, and attitudes toward employment and retirement. The magnitude of the differences shows that employed persons of these ages are a select group and that assumptions concerning the labor force potential of unemployed older persons cannot be made from studies on employed persons nor from usually available population statistics, such as age and sex.

A scale of availability for employment was developed from answers to questions about job-seeking activities, interest in applying for employment, and physical disability. About one-quarter of the men and one-eighth of the women between ages 45 and 65 years considered themselves available for work. Only about 6 percent of men and women over age 65 indicated that they would consider employment. These proportions vary when considered in relation to the length of time since last employment and the kinds of previous occupations. In general, occupational groups which require the least skill or experience contain the highest proportions of persons who consider themselves available for reemployment. The scale used to rate availability shows logical relationships to household characteristics, attitudes toward employment and retirement, sex, and age. Furthermore, the answers regarding specific conditions under which individual respondents would be willing to accept employment were, in the main, consistent with other answers given in the interview. For example, among persons rated high in employment availability, the type of work that they would consider applying for was consistent with their previous experience and educational level.

Although availability for work is associated

with health, still about one-quarter of the people who said they would consider employment had reported both chronic conditions and limitations of activity. In assessing the potential for employment of older people it is not sufficient to obtain information only on willingness to work. Information is also needed on degrees of physical limitations that may constitute practical barriers to employment.

Illness and Limitation of Activity

The primary purpose of obtaining information on chronic illness and limitations was to relate it to employment availability. However, it was thought that there is enough current interest in health surveys to warrant a discussion of this subject in a separate section of the monograph. Since the collection of a large volume of morbidity data was not a primary objective of the study, the data from the sample of 600 households in Hagerstown cannot be generalized to other areas but may be useful as guides in health survey planning in other areas.

This survey differs from most household illness surveys in that each person on whom information was obtained responded for himself. This avoids any bias, particularly with respect to sex differences, that results from acceptance of proxy respondents. In this study, as in others, women have a higher prevalence rate of chronic conditions than do men of corresponding ages. The higher rate for women exists only from conditions reported to be of an episodic nature. More severe conditions affecting the respondent "all the time" existed in equal proportions of men and women.

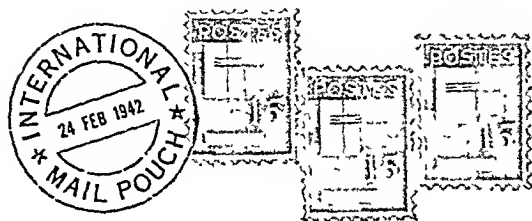
Ninety percent of the men between the ages of 45 and 64 years who were not in the labor force reported one or more chronic conditions which affected them all the time. Only 14 percent of men 45 to 64 years old who were in the labor force reported such conditions. Similar differences, though not to such a marked degree, exist for women 45 to 64 years of age and for men and women aged 65 years and over. No association between labor force status and the prevalence of chronic conditions which affect the person only "off and on" are evident from this study.

A qualitative scale of activity limitations was

tried in the Hagerstown survey and no difficulties were encountered in its use. The scale ranged from reduction in various types of activity to confinement in a bed or chair.

The degrees of limitation were related to age, sex, employment status, availability for work,

and type and severity of conditions reported. Associations found indicate that a qualitative scale of limitations is a useful yardstick for measuring disability and may, for certain purposes, be more practical than quantitative measures such as days in bed.



Mexican Medical Curriculum

Teaching preventive medicine and public health at 10 medical schools in Mexico has been stimulated through a project of the Dirección de Estudios Experimentales en Salubridad Pública. Three more medical schools have established departments of preventive medicine and 7 others are collaborating with the Dirección. A University of Guadalajara professor, studying at the School of Public Health under a Dirección scholarship, will return to head his school's department of preventive medicine. Through several projects a total of 17 physicians and 4 nurses are studying on Dirección scholarships at the School of Public Health.

—TROIS E. JOHNSON, M.D., M.P.H., *formerly chief, health, welfare, and housing field party, U. S. Operations Mission, Mexico.*

Disease Intelligence Center

The Philippines' Department of Health is planning a disease intelligence center to provide information for the prevention and control of disease. Communicable illnesses are still the country's major health problem and many are unidentified and unrecognized. Sudden outbreaks often reach epidemic proportions.

The center will centralize three preventive medicine disciplines—statistics, epidemiology, and laboratory—and supply data to plan and evaluate health

services involved in preventing and controlling communicable diseases. To provide maximum facilities and personnel, the center will coordinate the cooperating hospitals, medical schools, and other government agencies.

The center will employ a special mechanism for reporting unusual outbreaks of disease, using city, provincial and rural health personnel, private physicians, hospitals, school authorities, and other selected sources. The information the center collects will supplement the usual morbidity and mortality reports.

—FRANK S. MORRISON, *analytical statistician, U. S. Operations Mission, Philippines.*

Jiquilisco's Health Center

The people of Jiquilisco, El Salvador, wanted a health center so much that at a general meeting they donated close to 25 percent of the materials as well as the labor and transportation needed to build it. The sanitarian consultant has been working with the USOM community development specialist, organizing a program for this town of 6,000.

—VERNON R. SCOTT, *sanitarian consultant, Health and Sanitation Division, U. S. Operations Mission, El Salvador.*

First Rural Health Unit

The first rural health unit in Liberia was dedicated at Salala in the Central Province. The unit has a 5-bed ward, delivery room, clinic, combination drug room and laboratory, and waiting room. A midwife, nurse, and dresser staff it, and a doctor visits once a week. The rural health center is part of the effort to extend services to women and children.

—E. MASTHOFF, M.D., *Health and Sanitation Division, U. S. Operations Mission, Liberia.*

How to Study the Nursing Service of an Outpatient Department

PHS Publication No. 497. 1957. By Apollonia O. Adams. 75 pages. 50 cents.

Intended primarily as a guide with which nursing personnel and nursing service administrators of an outpatient department can study how closely their services relate to the goals of their agency or institution and to the goals of good nursing service, this manual can be used to analyze functions and needed skills of all personnel under nursing supervision.

The manual is a collection of a series of studies, such as utilization of nursing personnel, patient waiting, facilities for teaching, record flow in relation to nursing service, and other factors which affect nursing personnel. These can be made individually or as one large study.

This is the fourth in a series developed by the Division of Nursing Resources, Public Health Service, for use by hospitals and others desiring to study nursing services.

The Clinical Center: Current Clinical Studies and Patient Referral Procedures

PHS Publication No. 284. Revised 1957. 32 pages.

Intended for physicians interested in the possibility of referring patients for study to the Clinical Center, National Institutes of Health, Public Health Service, this revised brochure outlines the referral procedures in detail.

The principal study projects for which patients are currently being admitted, and some of the more important diagnostic or other criteria for admission are described briefly.

This publication is revised period-

ically. Hospitals, clinics, medical schools, medical societies, medical journals, and individual physicians will be placed on a mailing list on request to the Director of the Clinical Center, National Institutes of Health, Public Health Service, Bethesda, Md.

The Cancer Quacks

PHS Publication No. 559. 1957. By Charles S. Cameron. 18 pages.

The dangers to life and health for those who fall victim to cancer quacks are set forth with force and clarity in this chapter from Dr. Cameron's book *The Truth About Cancer*, written for the layman.

He describes the three kinds of quack, the quacks themselves, and their patients, and tells what can be done about quackery.

The policy of the National Cancer Institute, Public Health Service, regarding investigation or evaluation of proposed cancer treatment is given in the appendix.

The Older Person in the Home

PHS Publication No. 542. 1957. 34 pages. 20 cents.

Families with older members living in their homes are given specific suggestions for health and happiness in the three-generation household. Some of the most common problems confronting them, physical, mental, and emotional, are discussed.

One section of the booklet is devoted to the more difficult problems that arise when the eldest member is seriously handicapped, and another section gives pointers to consider if it seems necessary for the aged person to move into a nursing home or old people's home.

Although addressed primarily to the housewife, as the key person in the household, the booklet will also

be of interest to public health workers, social workers, religious leaders, and others who provide services to elderly persons and their families.

A bibliography, including available films, is provided.

Municipal Water Facilities, Communities of 25,000 Population and Over

PHS Publication (unnumbered). 1957. 163 pages.

Water supply data for organized community water facilities of approximately 850 municipalities in the United States and Territorial possessions as of December 31, 1956, are inventoried. These data reflect changes during the previous year.

The inventory is designed to aid industry and government in planning broad water developments as well as in planning for industrial expansion and national emergencies.

Information Leaflet

THE FOOD YOU EAT AND HEART DISEASE. *PHS Publication No. 537.*

(Health Information Series No. 89) 1957. 11 pages. \$5.00 per 100. Answers many questions asked by the general public on relation of diet to cardiovascular disease. Gives five diet tips for people with any kind of heart disease.

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared by other Federal agencies.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications other than its own.

Medical care expenditures of farm-operator families have increased sharply in the past 20 years, with a decrease in the farm-urban disparity, improvement in the relative position of southern families, and changes in the distribution of the medical care dollar.

Farm Medical Care Expenditures

JEAN L. PENNOCK, M.A.

FARM-OPERATOR families in 1955 spent, on the average, \$240 per family for medical care. Spending per person in these families amounted to \$63. Comparison of this figure with per person expenditures of \$10 by farm families and \$19 by urban families in 1935-36 (1), \$15 by farm families and \$32 by urban families in 1941 (2), and \$65 by urban families in 1950 (3) reveals a tremendous increase in the level of expenditures in the past two decades and indicates that farm and urban families are becoming more similar in spending for medical care.

Part of this increase in medical care expenditures is due to the change in price level (4). But when this is taken into account, a tripling in medical expenditures for members of farm families since 1935-36 and a doubling since 1941 remain (table 1).

Beyond the rise in prices, it is difficult to pinpoint factors that explain the change in medical care expenditures. It is easier to point out some of the things that are not responsible.

Only part of the change can be attributed to an increase in the income of the farm population; although the real income of farmers rose rapidly during the early years of the war and remained relatively constant at a high level from 1943 through 1946, it then began a slow decline

that, with interruptions, continued through 1955 and brought it in that year to a point only about 20 percent above the 1941 figures (5). Only fragmentary data are available on the movement of farm-family expenditures for medical care between 1941 and 1955, but indications are that in dollars of constant purchasing power they have risen more or less continuously throughout the period. An estimate for the farm population in 1945, derived from a survey in the North Central region and in the South, would indicate that at that time medical care expenditures were far short of the 1955 level. Home accounts of a group of farm families submitting their records to State universities show that the medical care expenditures of this group rose steadily throughout the period (6). These account-keeping families are not typical of all farm families, but it is assumed that their accounts reflect the trend in farm spending.

Our aging population might be expected to push medical costs upward, but on examination the effect of the change in the age distribution of the farm population is found to be negligible. Increases in the proportion of children, the age group with the lowest average expenditures, appear to cancel out increases at the other end of the age range, where expenditures tend to be high. This conclusion assumes the relationships in expenditures by age found by Mushkin in the 1950 urban data (7).

The explanation for the increase in farm expenditures for medical care must be sought

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in part in the wide complex of factors determining the general living expenses among farm families, for the medical care situation is not an isolated phenomenon. Expenditures for all categories of consumption combined have risen almost as much proportionally as have medical care expenditures, and a few categories have shown even sharper increases. In spite of the very large increase in medical care expenditures, this category accounted for only 1 percent more of the total consumption expenditures in 1955 than it did in 1941.

Gains Since 1941

For the same array of goods and services included under medical care in the 1941 study, farm families were spending \$235, on the aver-

Table 1. Main categories of medical care expenditures in current dollars and in dollars of constant purchasing power, farm-operator families and single farm operators

| Expenditure category | 1955 | | 1941 | 1955 as a percent of 1941 computed in 1941 dollars |
|--|-----------------|------------------------------|------|--|
| | In 1955 dollars | In 1941 dollars ¹ | | |
| All medical care ² | \$235 | \$126 | \$60 | 210 |
| Health insurance and prepayment plans..... | 42 | 13 | 3 | 433 |
| Direct expenditures..... | 193 | 113 | 57 | 198 |
| Physicians' services ³ | 63 | 39 | 22 | 177 |
| Dental care ³ | 29 | 17 | 9 | 189 |
| Eye tests and glasses ³ | 13 | 10 | 5 | 200 |
| Hospital care..... | 36 | 11 | 7 | 157 |
| Medicines and drugs ² | 39 | 29 | 10 | 290 |
| Other ³ | 13 | 7 | 5 | 140 |

¹ Adjusted by the consumer price index (4). The most suitable component of the index has been applied to the individual categories of medical care expense and the total obtained by addition. Since health insurance was not included in the index in 1941, hospital care, the major component of health insurance, was used for that year.

² In this table, vitamin and mineral preparations, a component of medicines and drugs in the 1955 data in tables 2, 3, and 4, have been excluded to achieve comparability with the 1941 data.

³ To achieve comparability with the 1941 data, unitemized expenditures reported on the 1955 schedules have been allocated to these items proportionately.

⁴ Includes nursing care, services of other practitioners (osteopaths, naturopaths, chiropractors, faith healers, midwives), laboratory tests and X-rays, medical appliances and supplies, and ambulance service.

age, in 1955, as compared with \$60 in 1941 (table 1). When this is converted to 1941 dollars to eliminate the effect of the price change since that year, they are found to be buying a little more than twice as much in 1955 as in 1941. Moreover, this comparison of data for families understates the change in per capita expenditure since average size of farm families decreased from 4.0 to 3.8 persons in this period.

All the items of medical care have not shared equally in this gain. Health insurance appears to have made the greatest gain, although premiums paid cannot be measured precisely in dollars of constant purchasing power because there is no measure of the change in price of this item over the whole period. Consumption of medicines and drugs appears to have tripled. This increase is of particular interest since it might be expected that as the amount of medical care increased, there would be a decline in self-medication and therefore no more than a moderate increase in the volume of drugs bought. At least two factors have operated to increase expenditures. Dispensing of drugs by physicians has been decreasing over the past several decades, with a resulting increase in purchases. Also, the period since 1941 has been marked by the introduction of a wide range of antibiotics and other new drugs that are in a completely different price range from the old drugs. It is also possible that there was over-reporting of this item in 1955, although there is no conclusive evidence on this point.

The relative increases for the other major components of medical care were less than that for the category as a whole. If, however, instead of considering health insurance as a separate component, one-third of the premiums are assigned to physicians' services and two-thirds to hospital care, the volume of physicians' care used is found to have increased in almost the same proportion as all medical care, and the volume of hospital care to have made a greater increase.

While health insurance and medicines and drugs, the items that made large individual gains, account for more than 40 percent of the total increase, some of the items that made smaller gains also contributed substantially. Direct expenditures for physicians' services ac-

Methodology and Definitions

Data on medical expenses in 1955 were obtained as part of a survey of farm-operators' farm and family expenditures conducted jointly by the U. S. Department of Agriculture and the U. S. Bureau of the Census to provide a set of weights reflecting expenditure patterns of a recent year for use in calculating the parity index, and to improve the basis for estimating farm-operator production expenses (8). Because of the large number of items for which data were required, two national samples were used, data on production expenses being obtained from one and data on family living expenses and income from the other. In the sample providing data on family living expenses there were 3,985 families and single individuals.

In this survey, expenditures for medical care include health insurance premiums and dues to prepayment plans paid by the family, and expenses for the treatment of illness and routine physical and dental examinations incurred by the family in the schedule year and not covered by insurance. Ex-

penses were reported even though payment may not have been made within the schedule year.

The following differences in definitions relating to medical care exist between the various studies cited here:

In the 1950 and 1955 studies, vitamin and mineral preparations are classified as medicines and drugs, hence in medical care. In the earlier studies these items were considered to be food supplements and were classed with food. Inclusion of these preparations raises the average farm-family expenditures in 1955 from \$37 to \$43.

Expenditures for health insurance prepayment plans were not covered in the 1935-36 study. This disparity does not affect the comparability of the data materially since there was very little of this type of insurance at that time.

More detail on medical care expenditures from this survey will be available in forthcoming publications of the Department of Agriculture.

count for a fourth of the gain; although the relative increase in this item was below the average for medical care, the item was such a large component of the total in 1941 that even a moderate percentage increase resulted in a substantial increase in the total amount. Similarly, dental care, although showing a much less dramatic rise in expenditures than did health insurance, contributed almost as much as health insurance to the overall gain.

The prices of the components of medical care did not change equally over the period 1941-55. As measured by the consumer price index of the Bureau of Labor Statistics, the cost of services increased more than the cost of goods. The greatest price increase occurred in hospital rates.

As a result of price changes and differences in the volume of services and goods consumed, there have been changes in the distribution of the medical care dollar. Physicians' services, including those paid for directly and by insurance, are still the largest single component, but they have become somewhat less important, taking only 33 cents of the medical care dollar

instead of 38 cents. Dental care and eye tests and glasses also showed small losses in importance. The greatest change occurred in hospital care; the proportion of the medical care dollar spent for this item, either directly or through insurance, almost doubled.

Farm-Urban Comparisons

As was pointed out earlier, in 1950 urban families spent, on the average, \$65 per person for medical care. If between 1950 and 1955 they increased their spending in proportion to the increase shown by all United States consumers (and this is a reasonable assumption since they constituted almost two-thirds of all consumers in 1950), by 1955 they were spending \$81 per person. If this is so, in that year the level of spending of rural families (\$63 per person) was about 80 percent of that of urban families, whereas in 1941 it was less than 50 percent. The amount of money spent is not a precise measure of the volume of services received, since there may be a price differential between urban and rural areas.

The division of the medical care dollar between health insurance and prepayment plans on the one hand and direct expenditures on the other seems to be much the same in urban and farm families, but fewer farm families have the protection of insurance. In 1950, 64 percent of urban families reported premium payments and presumably in the 5 years between surveys this proportion increased somewhat, but in 1955 only 51 percent of farm families were making such payments. The average premium paid in 1955 by farm families carrying insurance was considerably larger than the average premium paid in 1950 by urban families with insurance: \$82 as contrasted with \$53. Although no direct comparison of coverage obtained is possible, it is readily apparent that the covered farm family has considerably less

protection than the covered urban family. The difference in premiums is barely enough to offset the price rise in the intervening years. Additional considerations are that fewer farm than urban families obtain their insurance in connection with employment and therefore fewer benefit from the contributions of employers, and that many farm families are not in a position to take advantage of group insurance plans and the savings they make possible.

Effect of Income and Other Factors

Income is an important determinant of expenditures since families cannot continuously spend beyond their resources. The expenditure data classified by income must be interpreted

Table 2. Medical care expenditures, by family income, farm-operator families and single farm operators, 1955

| Region and income class ¹ | All medical care | | Health insurance | | Direct expenditures | | Percent of families having expenditures for— | | Average family size | Number of families represented by sample |
|--------------------------------------|------------------|------------|------------------|------------|---------------------|------------|--|---------------------|---------------------|--|
| | Per family | Per person | Per family | Per person | Per family | Per person | Health insurance | Direct expenditures | | |
| United States | \$240 | \$63 | \$42 | \$11 | \$198 | \$52 | 51 | 99 | 3.8 | 4,760,050 |
| Under \$250..... | 252 | 74 | 33 | 10 | 219 | 64 | 40 | 97 | 3.4 | 429,233 |
| \$250-\$499..... | 152 | 45 | 25 | 7 | 128 | 38 | 32 | 96 | 3.4 | 211,320 |
| \$500-\$999..... | 145 | 45 | 17 | 5 | 129 | 40 | 27 | 96 | 3.2 | 583,147 |
| \$1,000-\$1,499..... | 186 | 53 | 30 | 9 | 156 | 45 | 42 | 99 | 3.5 | 519,675 |
| \$1,500-\$1,999..... | 209 | 55 | 34 | 9 | 174 | 46 | 45 | 100 | 3.8 | 484,019 |
| \$2,000-\$2,999..... | 249 | 61 | 46 | 11 | 202 | 49 | 58 | 99 | 4.1 | 840,136 |
| \$3,000-\$3,999..... | 271 | 65 | 56 | 13 | 215 | 51 | 66 | 99 | 4.2 | 605,229 |
| \$4,000-\$4,999..... | 277 | 62 | 65 | 14 | 212 | 47 | 68 | 99 | 4.5 | 322,408 |
| \$5,000-\$7,499..... | 360 | 86 | 64 | 15 | 296 | 70 | 69 | 100 | 4.2 | 350,072 |
| \$7,500 and over..... | 431 | 100 | 79 | 18 | 352 | 82 | 69 | 100 | 4.3 | 176,385 |
| North Central | 241 | 65 | 48 | 13 | 193 | 52 | 56 | 100 | 3.7 | 1,686,776 |
| Under \$1,000..... | 214 | 67 | 28 | 9 | 187 | 58 | 37 | 99 | 3.2 | 383,612 |
| \$1,000-\$1,499..... | 191 | 62 | 39 | 13 | 152 | 49 | 53 | 99 | 3.1 | 168,071 |
| \$1,500-\$1,999..... | 205 | 62 | 40 | 12 | 165 | 50 | 49 | 100 | 3.3 | 192,436 |
| \$2,000-\$2,999..... | 238 | 63 | 52 | 14 | 186 | 49 | 61 | 100 | 3.8 | 349,941 |
| \$3,000-\$4,999..... | 264 | 60 | 64 | 15 | 200 | 45 | 68 | 100 | 4.4 | 364,568 |
| \$5,000-\$7,499..... | 327 | 73 | 60 | 13 | 267 | 59 | 72 | 100 | 4.5 | 118,015 |
| \$7,500 and over..... | 295 | 72 | 68 | 17 | 227 | 55 | 73 | 100 | 4.1 | 50,502 |
| South | 222 | 57 | 34 | 9 | 188 | 48 | 45 | 98 | 3.9 | 2,275,320 |
| Under \$500..... | 183 | 52 | 24 | 7 | 159 | 45 | 32 | 96 | 3.5 | 331,087 |
| \$500-\$999..... | 142 | 44 | 15 | 5 | 127 | 40 | 24 | 95 | 3.2 | 372,517 |
| \$1,000-\$1,499..... | 176 | 46 | 24 | 6 | 153 | 40 | 35 | 100 | 3.8 | 298,873 |
| \$1,500-\$1,999..... | 204 | 47 | 27 | 6 | 176 | 41 | 41 | 100 | 4.3 | 221,636 |
| \$2,000-\$2,999..... | 263 | 58 | 40 | 9 | 223 | 50 | 54 | 99 | 4.5 | 372,353 |
| \$3,000-\$7,499..... | 288 | 69 | 54 | 13 | 234 | 56 | 65 | 99 | 4.2 | 486,292 |
| \$7,500 and over..... | 487 | 116 | 88 | 21 | 399 | 95 | 74 | 100 | 4.2 | 60,051 |

¹ Total money income as collected in this survey was subject to under-reporting, particularly for income from operation of the farm. The income distributions given here are not corrected for this under-reporting, but should nevertheless be useful for classifying families into homogeneous groups (with respect to 1955 income), for the presentation of expenditure data.

with the knowledge, however, that there was substantial under-reporting of income in this as in most surveys. Estimates of aggregate net farm income derived from the 1955 survey are as much as a third below estimates based on other data, but nonfarm income is in line with other estimates. Since the degree of under-reporting probably was not constant among all respondents, there is undoubtedly some error both in the absolute level at which some families are classified and in their relative positions in the income scale.

Average expenditures per person ranged from \$45 among families reporting incomes of \$250 to \$1,000 to \$100 among families with incomes of \$7,500 and over (table 2). Families in the lowest income class (under \$250) reported larger expenditures than those with somewhat higher incomes. Although it can be assumed that some of these families are misclassified as a result of under-reporting of income, it is also probable that some of them are in the lowest class because of temporary fluctuations in income. For the latter group, ill health may partly explain both their income position and the size of their medical care expenditures, but this can be only a minor factor as the same relationships can be observed in the total consumption expenditures and in those for other categories.

In the group with reported incomes under \$2,000, which included almost half of all farm families, medical care expenditures averaged \$55 per person or less. Those with reported incomes between \$2,000 and \$5,000, slightly more than a third, had per person expenditures averaging between \$60 and \$65. Expenditures rose rapidly among families with incomes of \$5,000 or more.

At all income levels, the proportion of families reporting some direct medical care expenditures was high, with only a slight tendency to increase with income. The proportion of families reporting expenditures for health insurance was considerably lower and was more closely related to reported income, rising with it. There was less variation with income in per person expenditures in the North Central region than in the South (table 2). Average per person expenditures in families with incomes below \$3,000 were lower in the South than in

the North Central States, but when incomes were \$3,000 or more southern families spent more per person.

Other characteristics than income are also of importance in determining expenditures. Frequently, however, these characteristics have systematic relationships among themselves and with income that make it difficult to show by means of simple tabulations such as those presented here which characteristics are most closely related to the variation. In table 3 expenditures by race, tenure, education of the operator, and family size are shown for all farm families and for families in a relatively narrow income band. In the latter group, much of the effect of variation in income is eliminated, but other internal relationships are not controlled. For example, nonwhite families are less likely to be in the owner class, they have lower educational attainment as a rule, and the families tend to be larger.

In the South, where 19 percent of all respondents were nonwhite, medical expenditures show a difference by race. In families with incomes below \$3,000, who constitute 85 percent of the nonwhite and 67 percent of the white respondents, medical care expenditures of nonwhite families tended to be about half those of white families of comparable income. Since nonwhite families are larger on the average than white families, the difference was even greater on a per person basis. Interestingly enough, white and nonwhite families carried some type of health insurance in about the same proportions, but the average premium or dues payment was smaller among nonwhite families. Race had a greater effect on expenditures for medical care than on total consumption expenditures. This may result from differences in facilities available to the two groups. It may also be the indirect effect of education, for in this study medical care expenditures tended to rise with an increase in the education of the farm operator.

Two different regional patterns appear when medical care expenditures are classified by income and tenure. In the North Central region, tenants consistently spent more than owners with comparable incomes. In the South, however, owners spent more than cash-and-share

Table 3. Medical care expenditures, by selected family characteristics, farm-operator families and single farm operators, 1955

| Family characteristics | United States | | | North Central | | | South | | |
|----------------------------------|--------------------|------------------|---------------------|--------------------|------------------|---------------------|--------------------|------------------|---------------------|
| | Total medical care | Health insurance | Direct expenditures | Total medical care | Health insurance | Direct expenditures | Total medical care | Health insurance | Direct expenditures |
| | All incomes | | | | | | | | |
| All families..... | \$240 | \$42 | \$198 | \$241 | \$48 | \$193 | \$222 | \$34 | \$188 |
| Race: | | | | | | | | | |
| White..... | 253 | 44 | 209 | (¹) | (¹) | (¹) | 247 | 37 | 210 |
| Nonwhite..... | 118 | 23 | 95 | (¹) | (¹) | (¹) | 117 | 23 | 95 |
| Tenure: | | | | | | | | | |
| Owners and part owners..... | 250 | 44 | 206 | 236 | 46 | 191 | 246 | 38 | 208 |
| Tenants other than croppers..... | 221 | 39 | 183 | 260 | 54 | 206 | 158 | 20 | 138 |
| Sharecroppers..... | 78 | 18 | 59 | (²) | (²) | (²) | 78 | 18 | 59 |
| Education of operator (years): | | | | | | | | | |
| Less than 9..... | 211 | 36 | 175 | 230 | 44 | 186 | 189 | 28 | 161 |
| 9-12..... | 279 | 50 | 229 | 245 | 51 | 195 | 297 | 44 | 252 |
| 13 or more..... | 323 | 64 | 259 | (²) | (²) | (²) | (²) | (²) | (²) |
| Family size (persons): | | | | | | | | | |
| Less than 1.5..... | 79 | 17 | 62 | 80 | 20 | 60 | 63 | 15 | 48 |
| 1.5-2.4..... | 221 | 33 | 187 | 204 | 34 | 169 | 211 | 27 | 184 |
| 2.5-3.4..... | 260 | 44 | 216 | 254 | 48 | 206 | 264 | 36 | 228 |
| 3.5-4.4..... | 263 | 51 | 212 | 251 | 55 | 196 | 256 | 47 | 209 |
| 4.5-5.4..... | 269 | 55 | 213 | 278 | 62 | 217 | 246 | 44 | 202 |
| 5.5-6.4..... | 258 | 43 | 215 | 279 | 50 | 229 | 201 | 30 | 170 |
| 6.5 or more..... | 250 | 44 | 206 | 311 | 71 | 240 | 197 | 30 | 167 |
| Incomes of \$1,000-\$1,999 | | | | | | | | | |
| All families..... | \$197 | \$32 | \$165 | \$199 | \$140 | \$159 | \$188 | \$25 | \$163 |
| Race: | | | | | | | | | |
| White..... | 209 | 33 | 175 | (¹) | (¹) | (¹) | 210 | 26 | 184 |
| Nonwhite..... | 100 | 23 | 77 | (¹) | (¹) | (¹) | 100 | 23 | 77 |
| Tenure: | | | | | | | | | |
| Owners and part owners..... | 207 | 32 | 174 | 197 | 35 | 163 | 206 | 29 | 177 |
| Tenants other than croppers..... | 177 | 35 | 142 | 205 | 56 | 149 | 141 | 13 | 128 |
| Sharecroppers..... | 79 | 13 | 66 | (²) | (²) | (²) | 79 | 13 | 66 |
| Education of operator (years): | | | | | | | | | |
| Less than 9..... | 187 | 29 | 158 | 181 | 38 | 143 | 183 | 22 | 161 |
| 9-12..... | 214 | 38 | 176 | 218 | 40 | 177 | 206 | 35 | 171 |
| 13 or more..... | 274 | 54 | 220 | (²) | (²) | (²) | (²) | (²) | (²) |
| Family size (persons): | | | | | | | | | |
| Less than 1.5..... | 71 | 19 | 51 | 55 | 22 | 33 | 66 | 15 | 51 |
| 1.5-2.4..... | 194 | 32 | 161 | 182 | 36 | 146 | 195 | 28 | 168 |
| 2.5-3.4..... | 205 | 34 | 171 | 219 | 48 | 171 | 193 | 20 | 173 |
| 3.5-4.4..... | 253 | 40 | 213 | 238 | 45 | 193 | 263 | 35 | 228 |
| 4.5-5.4..... | 222 | 42 | 180 | 218 | 42 | 176 | 190 | 32 | 158 |
| 5.5-6.4..... | 183 | 24 | 159 | 219 | 35 | 184 | 161 | 20 | 141 |
| 6.5 or more..... | 157 | 21 | 136 | 234 | 41 | 193 | 133 | 18 | 115 |

¹ Data not tabulated because the percentage of nonwhite operators is small.
small number of cases.

² Data not shown because of

tenants with the same incomes, and the latter in turn spent more than sharecroppers. The pattern in the North Central region seems to represent a break with the past. It may be related to the higher educational attainment of tenants in this region; they tend to be considerably younger than owners and therefore to have progressed further before they left school. It may, however, reflect current attitudes toward farm ownership and the choice between saving to invest in the farm and spending for current consumption. It is possible that the higher expenditures of tenants represent a choice on their part of higher consumption and postponement of farm ownership, and a choice on the part of the owners to build up their investment in the farm. In the South, it must be recognized that the pattern by tenure is strongly influenced by the racial pattern. The proportion of nonwhite operators is largest among sharecroppers and smallest among owners. The pattern of educational attainment is also the reverse of that in the North Central region; the higher the position on the tenure ladder, the further the group has gone in school.

For the farm population as a whole, expenditures per family increased with family size until the 3-person family was reached; they remained at a fairly constant level until the

6-person family was reached and then decreased among the largest families. This pattern, however, conceals sharp regional variation. In the North Central States the average expenditure tended to rise more or less consistently with family size throughout the entire range, while in the South it rose only until the three-person family was reached and dropped thereafter. In both regions there was a sharp increase in per person expenditures between the single individual and the two-person family; thereafter per person expenditures decreased with increase in family size.

Regional Comparisons

In 1955, medical care expenditures were lower among southern farm families than among those in the North Central region. This difference is due in part to lower income, lower educational attainment, and a higher proportion of nonwhites among the population in the South. That this is not the entire explanation, however, can be seen by comparing the expenditures of comparable groups in the two regions. At most income levels, southern families spent less than those in the North Central region (table 2). Furthermore, groups comparable as to tenure, education, or family size, in addition

Table 4. Detail of medical care expenditures, by region, farm-operator families and single farm operators, 1955

| Expenditure category | Average expenditures per family | | | Percent of families having expenditures | | |
|--|---------------------------------|---------------|-------|---|------------------|------------------|
| | United States | North Central | South | United States | North Central | South |
| All medical care..... | \$240 | \$241 | \$222 | (¹) | (¹) | (¹) |
| Health insurance and prepayment plans..... | 42 | 48 | 34 | 51 | 56 | 45 |
| Direct expenditures..... | 198 | 193 | 188 | 99 | 100 | 98 |
| Hospital care..... | 31 | 27 | 32 | 21 | 23 | 20 |
| Surgeons' care..... | 11 | 11 | 7 | 9 | 10 | 7 |
| Other physicians' (M.D.) care..... | 49 | 50 | 47 | 74 | 74 | 73 |
| Osteopaths..... | 3 | 5 | 1 | 6 | 11 | 2 |
| Other practitioners..... | 3 | 4 | 2 | 8 | 12 | 4 |
| Dental care..... | 28 | 30 | 20 | 54 | 62 | 46 |
| Eye tests and glasses..... | 12 | 13 | 10 | 34 | 39 | 29 |
| Nursing care..... | 2 | 1 | 2 | 2 | 1 | 2 |
| Laboratory tests and X-rays..... | 3 | 3 | 2 | 12 | 14 | 9 |
| Medicines and drugs..... | 43 | 37 | 46 | (¹) | (¹) | (¹) |
| Medical appliances and supplies..... | 2 | 1 | 1 | 13 | 14 | 10 |
| Other and unitemized medical expenses..... | 13 | 11 | 16 | (¹) | (¹) | (¹) |

¹ Not available.

to income, show a similar regional disparity (table 3). It is encouraging to note, therefore, that since 1945 expenditures have increased more in the South than in the North Central region. This can be attributed at least in part to a greater increase in income in the South and to a more than proportionate loss from the population of those groups whose expenditures are lowest—sharecroppers, other tenants, and non-white operators.

For most categories of medical care southern families spent less than North Central families (table 4). Only for medicines and drugs do they appear to spend substantially more. Direct expenditures for hospital care are somewhat higher, but when that proportion of insurance premiums assignable to hospital care is added to direct expenses, the total for northern families is higher. The higher expenditures of southern families for medicines and drugs, especially when occurring in conjunction with lower expenditures for physicians' care, seem to indicate a greater degree of self-medication.

The general patterns of expenditures in the two regions were similar. Such differences as were found, in line with the difference in amount of expenditures, indicate less care in the South. Fewer southern families had expenditures for dental and eye care, and smaller proportions of the medical dollar were spent on these items. Fewer southern families had direct expenditures for hospital care, and it probably follows that there were fewer hospital admissions. If health insurance premiums are assigned to the categories of care, expenditures for both hospital care and physicians' services were of greater importance in the North Central region than in the South. Since total medical expenditures were lower in the South than in the North Central region and expenditures for medicines and drugs were greater, it follows that a considerably larger proportion of the medical dollar went for medicines and drugs in the South.

This regional disparity is not confined to the farm segment of the population. In fact, per

person expenditures for medical care show that the relative position of the rural South is higher than that of the urban South:

| | United States | South |
|-----------------------------|---------------|-------|
| Farm operators, 1955..... | \$63 | \$57 |
| Urban population, 1950..... | 65 | 55 |

The urban South, however, has considerably less effect on the national average for the urban population than does the rural South on the national rural figure, since less than one-fourth of all urban families live in that region as compared with almost one-half of all rural families. If the South carried the same weight in both the urban and farm populations, much of the present difference between urban and rural expenditures would disappear.

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Available data indicate an increase in body fat up to about age 50, with women gaining more than men. It is suggested that "the secret to a long life for a body pleasantly surfeited with fat may be found by studying older women."

Age Changes in Body Composition

OLAF MICKELSEN, Ph.D.

EVALUATION of age changes in the composition of the body is hampered by the inadequacy of current procedures for determining body composition. Although a number of techniques have been proposed, only a few of these have been validated by direct carcass analysis. Validation has been done only on experimental animals.

In order to simplify the problem of determining body composition, the body may be said to be composed of the skeleton, fat, and fat-free tissue (muscle). For any individual, the weights of the skeleton and of fat-free tissue appear to be fixed within relatively narrow limits. The weight of body fat, however, covers a relatively wide range.

The methods used in determining body composition provide, at best, estimates of the size of either the fat or fat-free tissue. Either one or both of these components may be measured, but usually only one is determined. The mathematical equations that have been developed for computing the percentage composition of the body contain factors that make allowances for the weight of the skeleton. Minerals are one of the chief components of the skeleton, but since minerals account for a relatively small percentage of the body weight, any variation in the size of this component will have only a minor influence on body composition.

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Although it would be desirable to know the changes that occur with age in all body components, most of the work in the field of body composition has been concentrated on determination of the amount of fat. This stems from the interest engendered during the past few years in obesity in general. Changes in the skeletal mass have been largely neglected.

On the basis of clinical experience it has been proposed that changes do occur in the skeletal mass. Many clinicians working in the field of geriatrics are impressed by the fragility of the bones in their older patients. This has been assumed by some to be due to a negative calcium balance, with a consequent depletion of bone minerals. However, a recent study suggests that "the onset of bone fragility in the aged is a composite effect of many factors and is probably more intimately related to endocrine changes, decreased activity, and loss of muscle tone than to level of nutrition" (1).

Methods of Determining Body Composition

A brief review of some of the procedures proposed for determining body composition will give some idea of the limitations and difficulties in this field. Although there are a number of methods for estimating the composition of the body, none of them is ideal. Each procedure has its limitations. The method that has been used most frequently as a reference or standard is the densitometric technique based on weighing the individual under water.

Because of its simplicity, comparison of the individual's height and weight with values listed in standard tables is probably the most commonly used procedure for obtaining crude estimates of body fatness, and thus, indirectly, of body composition.

Standard Height-Weight Tables

The height-weight tables most often used for evaluating body fatness are those compiled by the Association of Life Insurance Medical Directors on the basis of medical examinations performed on individuals applying for insurance during the years 1885 through 1910 (2). One of the most serious limitations in using these tables is the absence of a correction factor for the clothing and shoes worn by the individuals who were weighed (3). Another limitation is the disagreement as to the deviation in weight that must occur before an individual is considered obese. Values ranging from 5 to 20 percent have been proposed as the upper range of "normal" body weight for any height.

These tables make no allowance for variation in body build. Keys and Brozek (4) have shown that the variation in body build could be illustrated by the data of Munro (5). Munro found that the groups of selective service registrants of the same age and stature who had chest circumferences of 32, 37, and 42 inches had average weights of 130, 158, and 198 pounds, respectively. In general, the heaviest men had the largest body frames; yet the height-weight tables suggested only one weight (150 pounds) for individuals of this height. When compared with the values in the table, the men with the largest body frames would be as much as 36 percent overweight. That all of the heaviest men were not obese is suggested by the work of Welham and Behnke (6). Using the densitometric technique (described below), they found that professional football players who were in peak physical condition were 20 or more percent overweight according to the standard height-weight tables. However, on the basis of body density, these "overweight" men had very little fat in their bodies. If obesity is defined as a condition in which there is a surplus of body fat, these men obviously were not obese.

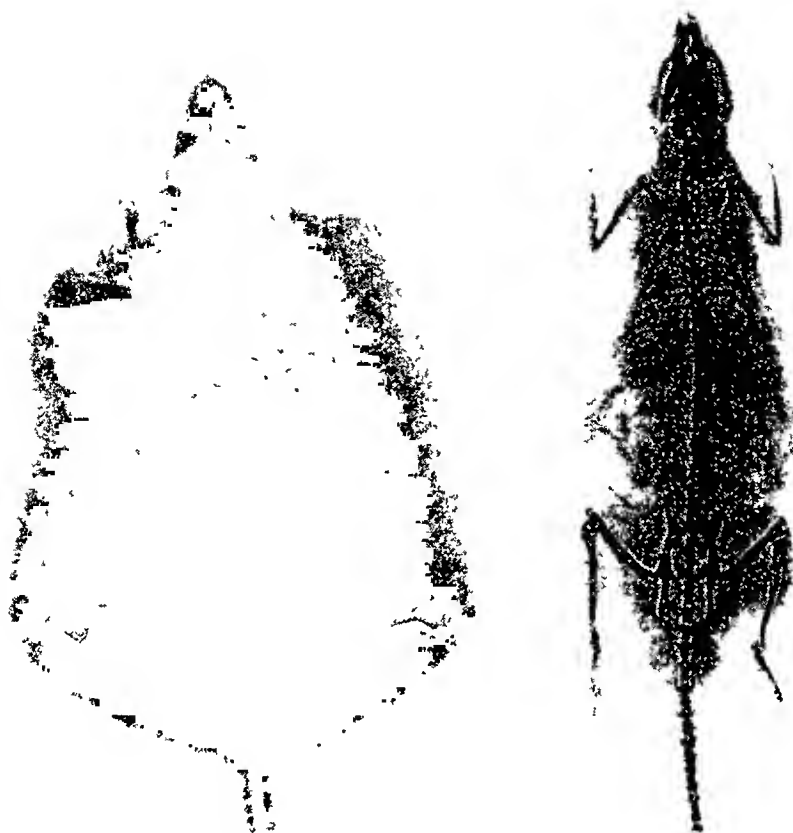
Subcutaneous Fat Determinations

Body fat has also been estimated from the thickness of skinfolds on various parts of the body. The skinfold is "lifted up" with the fingers from the underlying muscle. A variety of calipers are available for quantitating these measurements. This procedure is based on the observation that in man a large proportion of the total body fat is found in the subcutaneous tissue (4).

Unfortunately, there are practically no data on human beings to indicate the relative distribution of fat throughout the body in the lean and the obese. X-ray evidence is available for rats which became obese as a result of an ad libitum consumption of a high-fat diet (7). These rats, compared with their littermates fed a low-fat diet, showed a tremendous increase in the amount of fat in the subcutaneous area (see illustration). Associated therewith is a marked increase in the amount of fat in the abdominal cavity. The lean rat shows a proportionately smaller amount of fat, not only in the subcutaneous areas but in the abdominal cavity as well. Comparable data for guinea pigs have been presented by Pitts (8). The mass of the subcutaneous fat in the guinea pig was almost directly proportional to the total body fat.

The most extensive evaluation of the skinfold-thickness method for determining body fat has been made by Keys and Brozek (4). In their study the skinfold thickness at a number of sites on the body was determined for a large number of subjects. At the same time, total body fat in each subject was estimated by the densitometric method. On the basis of these measurements equations were developed for estimating the body fat from the skinfold thickness (9). Similar work has been done by Pascale and others (10, 11). The equations provide values which at best only approximate the body fat content as calculated from body density. A partial explanation for the inconsistent body fat values derived from the skinfold measurements stems from the finding that there is considerable individual variation in the distribution of subcutaneous fat throughout the body (4).

A few attempts have been made to determine the amount of fat in the body from X-rays of



X-rays of lean and obese littermate rats.

selected areas. Stuart and co-workers (12, 13) have used X-rays of the antero-posterior view of the right leg at the maximal width of the calf. These studies were confined largely to children. Reynolds (14) has extended this technique to the study of adults. He reported that the ratio of thickness of adipose tissue to bone width of the leg is much greater in women than in men. The ratio decreases with age in men but increases in women.

A recent report by Garn (15) on the fat content of adults as determined by X-rays suggests that there is very little difference in the absolute amount of fat in men and women. Since the body weights of the women were considerably lower than those of the men (58.3 as compared with 76.4 kilograms), the percentage differences in fat content were significant. Garn found that the average weight of fat in 107 healthy American women ranging in age from 20 to 60 years, with a mean of 39 years, was 13.7 kilograms, while that in 81 men in the same age

range was 12.6 kilograms. The fat content of the women was 23.7 percent, for the men 16.8 percent.

Densitometry

A procedure that has been studied rather extensively during the past few years determines body density and, from this, the relative composition of the body. The difference in density of body fat and the fat-free residue is great enough to permit calculating the amount of fat in the body from the body's density. This density has been determined by two different methods.

One method of determining body density is based on weighing the subject under water. This procedure received its greatest stimulation as a result of the studies of Behnke and co-workers (16). The technique is fraught with difficulties. The primary one is the inability of readily determining the residual air and the air that may be retained in the gastrointestinal

tract at the time of the underwater weighing. Body density can be corrected for residual air, but to do it accurately would make the determination both cumbersome and time-consuming. A standard correction cannot be made for residual air since there is considerable variation among individuals, as well as an increase in the absolute residual air volume with increasing age (4). A second difficulty is trying to weigh under water an individual who has any fear of being submerged. The latter is likely to be important with older people, especially those who have never learned to swim.

The other method for determining body density involves measurement of the body's volume. The volume of the body can be calculated by the displacement of helium in a chamber of known volume. This method has been used by Siri (17) for human beings and by Walser and Stein (18) for animals.

Theoretically, the gas-displacement technique should be far superior to the underwater-weighing procedure since any air in the lungs at the time of measurement should have practically no influence on the density. The anxiety associated with the method should be minimal. To what extent this modification of the densitometric method will be used is at present hard to predict.

Wedgewood and Newman (19) modified the Drinker respirometer so that the volume of the subject can be calculated from the changes in pressure associated with the pulsations of the bellows. The sensitivity and applicability of this technique have yet to be assayed.

Body Water

There are many data showing that in normal animals the relation between the amount of water and the amount of protein is fairly constant (20). The fat-free weight of the body can be calculated on the basis of this relationship. Since the minerals represent only a small fraction of the body (21, 22), slight variations in this component have a negligible effect on the results. The difference between the body weight of the individual and the calculated value for fat-free body tissue represents the weight of body fat.

A number of substances, such as urea, thionrea, deuterium oxide, tritium oxide, anti-

pyrine, and acetylaminopyrine, have been used in estimating body water. (For discussion of the various techniques and references thereto, see reference 4). A known amount of the substance is given by mouth (urea) or injected intravenously (the other substances). Blood samples are taken at intervals and analyzed for concentration of the injected substance. Total body water content can be calculated from the concentration of the substance in the blood at the different time intervals and the amount of the substance given. All the methods require from 1 to 3 hours for uniform distribution of the compound throughout the body water. The procedures necessitate all the care and safety precautions used in any intravenous therapy.

There are a number of situations in which the relationship between body water and protein deviates from the usual ratio. In most of these cases, especially those associated with edema, the abnormality is due primarily to a marked increase in the extracellular fluid. By determining the volume of the extracellular fluid as well as total body water, a correction can be made for the abnormal hydration. Recent work indicates that the extracellular fluid space as measured with thiocyanate decreases steadily from a little more than 40 percent in infancy to a constant value of 23 percent in adulthood (23).

Fat Solvents

Cyclopropane has been used at New York University for estimating the amount of fat in the body directly in studies with rats (24). The air the animal inhales contains a known amount of cyclopropane. The volume of gas retained in the body is proportional to the amount of fat in the body. So little has been done with this procedure, however, that it is difficult to evaluate its applicability and usefulness in studies with man.

Factors Influencing Body Composition

There is surprisingly little factual information on the changes that occur in the human body as it grows older. All of the studies have compared young individuals with older people. Since so many years separate a man's youth

from his old age, it is doubtful whether there will ever be any extensive longitudinal studies on adults to bridge the present gap.

Influence of Age

The height-weight tables of the Association of Life Insurance Medical Directors indicate that a half century ago both men and women continued to increase in weight even though there was no change in height as they became older (2). Changes comparable to these are still occurring. Recent data show that from age 25 to 60 years men in the United States who are 67 inches tall gain 8 percent in weight, while women of the same ages who are 63 inches tall gain 15 percent (25-27).

It has frequently been assumed that the increase in body weight with age is primarily, if not solely, due to an increase in body fat. Evidence for this assumption has been presented by Brozek (28), who compared a group of young men (18-25 years) with older men (45-54 years). Although the average heights for the two groups were the same, the older men were, on an average, 11 pounds heavier than the younger men. Underwater weighings corrected for residual air at the time the weights were recorded showed that the younger men had 14 percent fat in their bodies while the older men had 24 percent.

The increase in body fat associated with the increase in body weight that accompanies the aging process is accentuated by the apparent replacement of a certain portion of muscle mass with fat, according to evidence adduced by Brozek (28). Thirty-three young men (22 through 29 years) and an equal number of older men (48 through 57 years) were matched for height and weight. Specific gravities indicated that although there was no difference in height or weight between the two groups, the younger men had 16 percent fat in their bodies while the older men had 23 percent.

Influence of Activity

Physical activity, especially if it is strenuous, is associated with a marked reduction of body fat even though the body weight may be considerably in excess of the "standard" as listed in height-weight tables. Welham and Behnke (6) emphasized this point in their studies with

younger men. Brozek (28) and Brozek and Keys (29) found a similar situation among older men. The physically active men were seven pounds heavier than the inactive men even though the heights were the same in both groups. However, the heavier body weights were associated with a lower body fat content (24 percent as compared with 27 percent).

Males vs. Females

Garn and Harper (30) have studied the distribution of fat in males ranging in age from 20 to 69 years by means of roentgenograms. Thickness of the subcutaneous fat over the iliac crest showed the greatest increase with age. Fat in the trochanteric and deltoid regions also increased, but to a lesser extent than that in the iliac region. There were no measurable changes in the thickness of the adipose tissue on the anterior surface of the leg and the middle area of the lower arm. On the basis of the amount of fat in the trochanteric area, Garn and Harper estimated that the body fat increased from 16 percent in younger men to 22 percent in older men. These values are similar to those reported by Brozek (28).

For women the total body fat increased from 26 percent at age 25 to 38 percent at age 55, as shown in the tabulation. These values were for women whose body weights were, on an average, from 95 to 97 percent of those listed in the standard height-weight tables (31). When these values are compared with those for men equally lean according to the standard height-weight tables, it is obvious that the body fat content of women is much greater than for men at each age group.

| Age (years) | Total body fat (percent) | |
|----------------|-----------------------------|-------|
| | Men | Women |
| 25 ----- | 13.1 | 26.5 |
| 35 ----- | 17.3 | 30.5 |
| 45 ----- | 21.6 | 34.5 |
| 55 ----- | 25.9 | 38.5 |

NOTE: Percentages were calculated using a linear prediction equation based on the least square fit of the values obtained by the densitometric method corrected for residual air (31).

In women, the increase in body fat with age is associated with an increase of the fat in the abdominal area (32). Since this conclusion

was based on skinfold measurements, it was not possible to determine whether the increase in inner fat was due to the fatty infiltration of the organs. There was little change in the skinfold thickness of the extremities with age in women, but there were marked changes in the thickness of subcutaneous fat on the chest, side, waist, and back.

Edwards (33) determined the skinfold thickness in 53 areas of the body in males and females ranging in age from 5 to approximately 50 years. He found that the distribution of fat in the different parts of the body was the same in both sexes before puberty. After puberty, women had about 1.2 times as much fat on their legs, in proportion to the total amount of subcutaneous fat, as men. In all groups, the women had approximately 1.7 times as much fat in the subcutaneous areas as the men. It is difficult to determine from these data any absolute changes that occur with age.

Conclusion

Factual data on body composition are notably scarce. What we have indicate an increase in body weight up through approximately age 50 and a decrease thereafter (28). There are no data which indicate that the weight of the individual decreases after age 55.

The difficulty with the reported body weights of older people is the impossibility of determining whether the decrease in weight is due to the earlier deaths of the heavier individuals or represents an actual loss of weight with age. Although there is an increasing body of data from longitudinal studies of children, such information is woefully lacking for adults, especially for individuals over 60 years of age. Only longitudinal studies permit determination of the actual changes that occur with age.

Few studies bear upon changes in body composition occurring in women with the passage of time. The prominent attention that obesity has received during the past few years would make such studies desirable. The work of Skerjil and others (32) indicates that in older women of "standard" weight, more than one-third of their body is fat. Even under that "stress," if it is stress, women outlive men by a significant number of years. This suggests that

the secret to a long life for a body pleasantly surfeited in fat may be found by studying older women.

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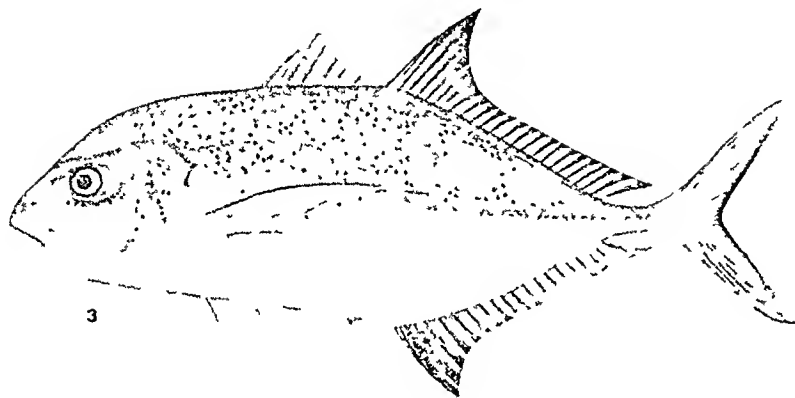
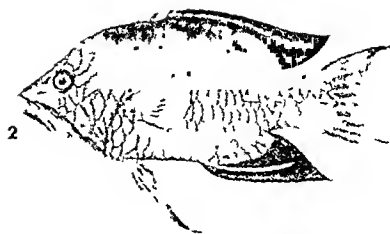
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Course in Control of Foodborne Diseases

A multidiscipline course in epidemiology and control of foodborne diseases will be offered at the Communicable Disease Center, Public Health Service, Atlanta, Ga., May 19-23, 1958.

The course is designed for physicians, veterinarians, nurses, nutritionists, dietitians, laboratory workers, environmental health supervisors, and other members of the public health team. Preference will be given to persons whose work concerns application of epidemiological techniques in this field.

Further information and application forms may be obtained from the Chief, Communicable Disease Center, Public Health Service, 50 Seventh Street, N.E., Atlanta 23, Ga. Attention: Chief, Training Branch.



Poisonous Fishes

BRUCE W. HALSTEAD, M.D.

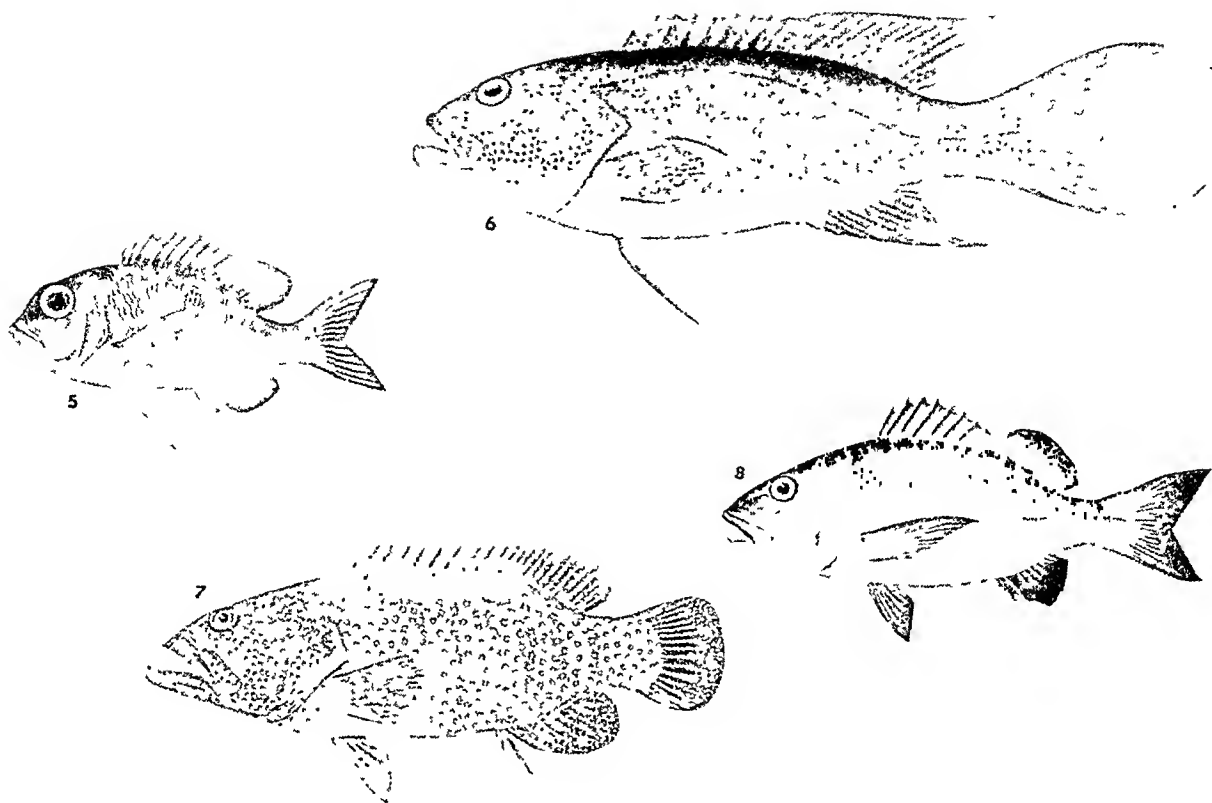
MAN'S KNOWLEDGE of poisonous fishes dates back to ancient times. At least one of the Mosaic laws is believed to have been aimed directly at eliminating poisonous fishes from the Israelite diet, "These ye shall eat of all that are in the waters: all that have fins and scales shall ye eat: And whatever hath not fins and scales ye may not eat: it is unclean unto you" (Deuteronomy 14: 9-10). The French archeologist Claude Gaillard reported that hieroglyphics and figures of the deadly *Tetraodon lineatus* appear frequently on ancient Egyptian tombs (1), and according to the Egyptologist Keimer, this scaleless species was recognized as poisonous during the time of the Pharaohs. Galen is said to have reported in his *De Alimentis* that the flesh of the moray is dangerous to eat (2). Alexander the Great forbade his soldiers to eat

fish during conquests because he believed that some species produced skin disorders.

Peter Martyr, the first historian of the West Indies, made the earliest reference to ciguatera in 1555 (3). In de Landa's famous *Relacion de Las Cosas de Yucatan*, written in 1566, the lethal qualities of puffers are mentioned (4).

Beginning with the 19th century, hundreds of publications appeared on the subject of fish

Dr. Halstead is generally regarded as the world's leading authority on poisonous fishes. He is chairman of the section of natural products, School of Tropical and Preventive Medicine, College of Medical Evangelists, Loma Linda, Calif. Until July 1, 1958, he is on military leave with the Division of Preventive Medicine, Naval Medical School, National Naval Medical Center, Bethesda, Md.



poisoning, including some comprehensive reviews and bibliographies (3, 5-11).

Because of their somewhat sporadic and unpredictable appearance, generally affecting only small numbers of persons at any one time, poisonous fishes have not attracted a great deal of attention in medical circles. However, the public health significance of poisonous fishes was pointed up in the series of outbreaks which occurred in Midway, Johnston, and the Line Islands, beginning about 1943 and reaching a peak about 1946 (12, 13).

Recent mass intoxications in the western Pacific have once again directed attention to the public health importance of poisonous marine organisms. These outbreaks began about 1952, became increasingly severe during 1955, and have continued until the present time, intoxicating a number estimated at more than 40,000 persons. The bulk of the outbreaks have taken place in Japan, the Philippine Islands, and more recently in Viet Nam. The causative agents were octopuses, *Octopus vulgaris*, *O. dofleini*, squid, *Omnastrephes sloani pacificus*, Jap-

anese horse mackerel, *Trachurus japonicus*, common Japanese mackerel, *Scomber japonicus*, flying fish, *Prognichthys agoo*, and oceanic bonito, *Katsuwonus pelamis*. All of the outbreaks have been seasonal, taking place during June to the middle of September. Bacteriological tests have been negative, and the degree of freshness of the organisms seems to have no bearing on the matter. The symptoms are similar to those produced by bacterial food poisoning, but no human pathogens have been isolated by Japanese epidemiologists. The mortality rate in the largest series of Japanese fish outbreaks in 1955 was 0.77 percent (14).

According to a report received from the Bureau of Fisheries of the Philippine Government, another series of outbreaks of fish poison-

Some fishes associated with ciguatera are illustrated across the top of these pages. They are: 1. Triggerfish, *Odonus niger*. 2. Wrasse, *Epibulus insidiator*. 3. Jack, *Caranx melampygus*. 4. Surgeonfish, *Acanthurus triostegus*. 5. Snapper, *Monotaxis grandoculis*. 6. Seabass, *Variola louti*. 7. Grouper, *Cephalopholis argus*. 8. Red Snapper, *Lutjanus raigiensis*.

ing took place in April 1957. The complete number of persons involved has not been determined as yet, but several deaths have been reported. The causative agent in most of the Philippine poisonings has been the oceanic bonito, *K. pelamis*. Philippine public health authorities are establishing regulations prohibiting the sale of the oceanic bonito in some localities. Some intoxications from fishes have been reported in Viet Nam, but as yet no details are available as to the nature of the outbreaks.

Since intoxications resulting from poisonous fishes are frequently confused with a variety of other ailments, a review of the epidemiological and clinical aspects of the problem of ichthyosarcotism is timely. The chemistry of these poisons has been reviewed elsewhere (31).

Epidemiology

Judging from the public health and toxicological reports that have appeared to date, any marine fish can under certain circumstances become poisonous as a result of its food habits. Toxicity is not species specific, except possibly in puffers or tetraodontoid fishes. More than 300 species of marine fishes have been incriminated as causative agents in producing human intoxications of the ciguatera type alone. Most poisonous fishes are shore forms rather than oceanic inhabitants. Fishes captured in deep waters far from shore are generally safe to eat. Some of the more common families of marine fishes which have caused human intoxications are listed under the various clinical types of fish poisoning.

Poisonous fishes are largely circumtropical in distribution, but on occasion occur in temperate waters. With the exception of 2 or 3 boreal species they are currently believed to have a maximum distributional range of 45° north and 45° south of the Equator. Particularly large populations of poisonous fishes are known to occur in the central Indo-Pacific area and in the West Indies. They are more common near islands than along continental shores. Within these general areas, poisonous fishes seem to be quite circumscribed in distribution. They may vary considerably in their distribution about a single island. A species may be toxic in one

part of the island, but edible in another. Lagoon fishes are more likely to be poisonous than those living on seaward reefs.

The toxicity of puffers or tetraodontoid fishes generally follows closely their reproductive cycle. The toxin content of the fish is greatest just prior to spawning. For most puffers, spawning takes place during late spring or early summer. Toxin content is lowest during fall and winter. There is some evidence that the barracuda (*Sphyræna* spp.) may follow a similar, but less pronounced, seasonal pattern. However, in most other species there is no evidence of a seasonal fluctuation.

The poison in tetraodontoid fishes is usually more concentrated in the liver, gonads, and skin, but other parts of the viscera may also be toxic. Puffer musculature is generally non-poisonous. The distribution of poison is exceedingly variable in other kinds of fishes. If a fish is toxic, the musculature will be found to be poisonous in about 50 percent of the specimens, and the viscera, in about 90 percent or more. However, the distribution of the poison in the body of the fish varies from one individual to the next.

No consistent pattern has been observed as to the relationship between the size of the fish and its toxicity. It has been observed that unusually large specimens of jacks (*Caranx* spp.), grouper (*Epinephelus* spp.), and barracuda (*Sphyræna* spp.) are more likely to be toxic than smaller specimens. This has not been found to be necessarily true in other species.

Aboriginal peoples have numerous methods by which they attempt to distinguish a poisonous fish from an edible one. The significance of color change in silver coins, color of the fish, condition of the gills, position of the scales, ad infinitum, is generally without scientific foundation. To the best of our knowledge, one cannot detect a poisonous fish by its appearance. The most reliable field method is to feed a small sample of the fish to a kitten or a dog. If the animal remains asymptomatic for 12 hours, the fish is generally safe to eat. Investigations are currently in progress at the School of Tropical and Preventive Medicine, Loma Linda, Calif., with the hope of developing a reliable rapid chemical field test.

Origin of the Poison

The origin of ichthyosarcotoxins in nature has been the subject of much speculation and folklore. Numerous theories have been propounded, but few have any scientific basis (15, 16). It is certain, with the single exception of scombroid poison, the poisons are not bacterial in origin. Putrefactive processes do not play a part in the production of fish poisons. There is no evidence of any relationship between the presence of ichthyosarcotoxins and radioactive substances in the water. It is believed that most of these poisons are derived from the food which the fish eats. Food probably plays an important role in the direct production of even puffer poison.

The most widely accepted theory propounds the idea that the toxic substances, or their precursors, are obtained directly from marine littoral algae. It is doubtful that plankton play any role in the mechanism. Herbivores feed on the plants. Carnivores feed on the herbivores and man may become poisoned from eating either of them. Stomach content analyses have revealed that algae are more frequently present in poisonous fishes than any other types of food (17), and toxicological tests of these algae have shown some of them to contain toxic substances (18). Moreover, controlled laboratory feeding tests demonstrate that it is possible to induce toxicity in carnivorous species without evidence of detrimental effects on the fish, by feeding them toxic fish flesh. Further chemical and stomach analyses will be required before the toxin-food chain theory can be definitely established. Experimental work in attempting to determine the origin of fish poisons in nature is currently in progress by the author.

The incidence of fish poisoning cannot be accurately determined since the disease is frequently misdiagnosed and generally unreported. In the past, several hundred cases of puffer poisoning were reported each year in Japan, during some years accounting for as much as 44 percent of all fatal cases of food poisoning in that country. Japanese public health authorities state that puffers continue to be their greatest single cause of food fatalities (19, 20). Probably the second most common

type of fish poisoning is ciguatera. Third on the list would be scombroid poisoning, with the other forms of fish poisoning being relatively uncommon. It is unfortunate that there are so few reliable statistical data available. Local public health authorities should encourage the reporting of outbreaks, since poisonous fish may constitute a serious public health and economic threat in some regions.

Recent biotoxicological surveys that have been conducted in the tropical Pacific give some idea as to the incidence of poisonous fishes in specific localities.

| Locality | Number species tested | Percent of species found toxic |
|-------------------------|-----------------------|--------------------------------|
| Phoenix Islands (16)--- | 93 | 29 |
| Johnston Island (16)--- | 60 | 75 |
| Galapagos Islands (29)- | 57 | 67 |
| Cocos Island (30)----- | 33 | 67 |

Among important field studies (7, 8, 21-23), Hiyama's work (7) is particularly useful, magnificently illustrated, and contains a valuable review of the poisonous fish problem in Saipan and the Marshall Islands. Only meager statistical data are contained in any of these reports, but they do aid in developing an appreciation of the scope of the problem in the regions discussed.

Clinical Characteristics

Since the chemical characteristics of fish poisons have not been defined, poisonous fishes may be tentatively classified on the basis of their phylogenetic relationships and symptomatology of the intoxications which they produce (10, 24). Certain fish groups are classified under more than one category. Although the weaknesses of this somewhat artificial system are recognized, it appears to be the most practical classification at present. Forms of ichthyosarcotoxism caused by fishes may be subdivided into the following clinical categories (see table).

Lamprey and Hagfish Poisoning

The slime and flesh of certain lampreys and hagfishes are reported to produce a gastrointestinal upset (32). The clinical characteris-

Diagnostic characteristics of the various types of ichthyosarcotoxism

| Type of poisoning | Causative fish | Symptomatology |
|---------------------------|---|---|
| Lamprey or hagfish----- | Lampreys, hagfish (slime, flesh). | Gastrointestinal upset(?). Precise symptomatology unknown. |
| Elasmobranch----- | Sharks, rays (liver, flesh)----- | Gastrointestinal symptoms predominate in mild cases; neurological symptoms in severe cases. Deaths reported, but case fatality rate unknown. |
| Chimaeroid----- | Chimaeroid or ratfish (flesh, viscera). | Neurological symptoms(?). Precise symptomatology unknown. |
| Gymnothorax or moray eel. | Moray eels (flesh, viscera)----- | Violent with convulsions and paraly. Case fatality rate about 10 percent or more. |
| Scombroid----- | Scombroid fishes—tuna, bonito, skipjack, etc. (inadequately preserved flesh). | Histamine-like reaction with nausea, vomiting, flushing of the face, swelling of the lips, urticaria, and pruritus. Symptoms subside usually within 12 hours. Antihistaminic drugs effective. |
| Puffer----- | Tetraodontoid or puffer-like fishes (viscera). | Rapid onset and extremely violent neurotoxic symptoms: paresthesias, motor paralysis, convulsions, death by respiratory paralysis. Case fatality rate about 61 percent. |
| Ciguatera----- | More than 300 species of tropical reef fish, including snapper, seabass, grouper, barracuda, wrasse, parrotfish, and surgeonfish. | Onset may be gradual or sudden. Symptoms mild to severe. Gastrointestinal and neurotoxic. Paresthesias, extreme weakness, joint aches, myalgia and paradoxical sensory disturbance predominate. Case fatality rate about 7 percent. |
| Gempylid diarrhea----- | Gempylids, escolar (flesh)----- | Diarrhea develops rapidly but is painless. No other untoward effects. |

tics of the intoxication, termed lamprey and hagfish poisoning, have not been completely defined.

Elasmobranch Poisoning

The most severe cases of elasmobranch poisoning usually result from the ingestion of the liver of sharks and rays. The musculature of some elasmobranchs is also reported as mildly toxic with the symptoms seldom more than that of a mild gastroenteritis with a predominating diarrhea. Ingestion of toxic liver results in the onset, usually within a period of 30 minutes, of nausea, vomiting, diarrhea, abdominal pain, headache, a rapid, weak pulse, malaise, cold sweats, oral paresthesia, a burning sensation of the tongue, throat, and esophagus. As time progresses, the neurological and other symptoms become more pronounced, resulting in extreme weakness, trismus, muscular cramps, sensation of heaviness of the limbs, blepharospasm, dilatation of pupils, hiccups, visual disturbances, joint aches, delirium, ataxia, incon-

tinence, dysuria, respiratory distress, coma, and death. The recovery period, if the victims recover, varies from a day or two to several weeks. The mortality rate is not known.

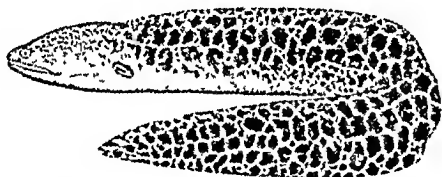
Chimaeroid Poisoning

The musculature and viscera of certain chimaeroids or ratfish have been incriminated as containing a neurotoxin. This form of ichthyosarcotoxism, if it occurs, would be termed chimaeroid poisoning. Only vague references have appeared in the literature regarding the toxicity of this group of fish, by Pellegrin in 1899, and by Phisalix in 1922. Halstead and Bunker reported in 1952 that the reproductive organs were toxic. Nothing is known about the nature of the toxin, or its relationship to other forms of ichthyosarcotoxism.

Moray Eel Poisoning

The musculature and viscera of some of the tropical marine muraenid or moray eels con-

tain a violent poison. The disease is termed gymnothorax or moray eel poisoning (25, 26). Symptoms of tingling and numbness about the lips, tongue, hands, and feet, with a feeling of heaviness in the legs, usually develop within several minutes to 8 hours after ingestion of the toxin. These symptoms may be followed by nausea, vomiting, diarrhea, abdominal pain, malaise, metallic taste, sore throat, laryngeal paralysis, meningismus, laryngeal spasm, aphonia, excessive mucus production, foaming at the mouth, intense perspiration, increased body temperature, crying out as if in pain, conjunctivitis, paralysis of the respiratory muscles, ataxia, general motor incoordination, trismus, violent clonic and toxic convulsions, abnormal deep and superficial reflexes, coma, and death. Sensory reactions to deep and superficial pain are usually normal. Characteristic signs of this form of intoxication appear to be the absence of thoracic respiration with pronounced abdominal breathing, profuse perspiration, violent convulsions, purposeless movements, and the extended period of time



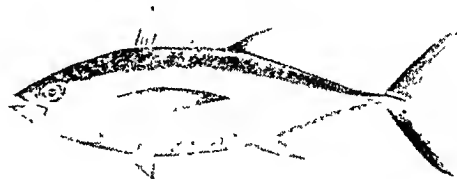
Moray eel, *Gymnothorax javanicus*

in which areflexia is present. In some cases the reflexes may be absent for a period of 2 months or more. The case fatality rate is estimated to be about 10 percent, and death is believed to be the result of respiratory paralysis.

Scombroid Poisoning

Some of the scombroids (tuna, skipjack, and bonito) may on rare occasions cause ciguatera, but usually they produce an entirely different form of intoxication, termed scombroid poisoning. This is the only type of fish poisoning in which bacteria appear to play an etiological role in the formation of the toxin. If scombroids are inadequately preserved, a toxic "histamine-like" substance is formed, possibly from the decarboxylation of histidine, a normal consti-

ment of fish flesh. Kawabata and associates have recently termed this substance "saurine" (33). Victims complain of fish having a "sharp or peppery" taste. The symptoms most often present are nausea, vomiting, flushing of the face, intense headache, epigastric pain, burning of the throat, difficulty in swallowing, thirst, pruritus, swelling of the lips, and urticaria, which are typical of a histamine reaction. Symptoms generally subside within 12 hours.



Tuna, *Neothunnus macropterus*

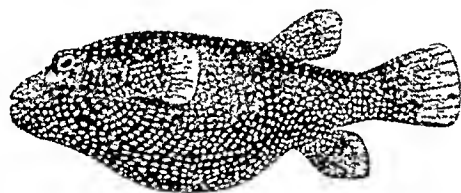
For some unknown reason scombroid fish appear to be more prone to producing intoxications of this type than other fish. The mortality rate is unknown.

Puffer Poisoning

The most violent form of fish poisoning is produced by tetraodontoid or puffer-like fishes. The disease is characterized by rapidly developing, violent symptoms. The onset and symptoms in puffer poisoning vary according to the person and the amount of poison ingested. However, malaise, pallor, dizziness, paresthesias of the lips and tongue, and ataxia most frequently develop within 10 to 45 minutes after ingestion of the fish, but cases have been reported in which the symptoms did not develop for 3 hours or more. The paresthesias which the victim usually describes as a "tingling or prickling sensation" may subsequently involve the fingers and toes, then spread to other portions of the extremities, and gradually develop into severe numbness. In some cases the numbness may involve the entire body, in which instance the patients have stated that it felt as though their bodies were "floating." Hypersalivation, profuse sweating, extreme weakness, precordial pain, headache, subnormal temperatures, decreased blood pressure, and a rapid, weak pulse usually appear early in the succession of symptoms.

Gastrointestinal symptoms of nausea, vomiting, diarrhea, and epigastric pain are sometimes present early in the disease, whereas in other cases they are totally lacking. Contradictory statements appear in the literature relative to pupillary changes, but these differences can probably be resolved on the basis of the time at which the examination is made. Apparently the pupils are constricted during the initial stage and later become dilated. As the disease progresses the eyes become fixed and the pupillary and corneal reflexes are lost.

Shortly after the development of the paresthesias, respiratory symptoms become a prominent part of the clinical picture. Respiratory distress, increased rate of respiration, movements of the nostrils, and diminution in depth of respiration are generally observed. Respiratory distress later becomes very pronounced, and the lips, extremities, and body become intensely cyanotic. Petechial hemorrhages involving extensive areas of the body, blistering, and subsequent desquamation have been reported. Severe hematemesis has also been known to occur. Muscular twitching, tremor,



Puffer, *Arothron meleagris*

and incoordination become progressively worse and finally terminate in an extensive muscular paralysis. The first areas to become paralyzed are usually the throat and larynx, resulting in aphonia, dysphagia, and later complete aphagia. The muscles of the extremities become paralyzed and the patient is unable to move.

As the end approaches, the eyes of the patient become fixed and glassy, and convulsions may occur. The victims may become comatose, but in most instances they retain consciousness and their mental faculties remain acute until shortly before death. Death results from a progressive ascending paralysis involving the respiratory muscles. On the basis of Japanese statistics, the case fatality rate is 61.5 percent. If death

occurs, it generally takes place within the first 6 hours, or within 24 hours at the latest. The prognosis is said to be good if the patient survives for 24 hours.

Ciguatera

More than 300 species of marine fish have been incriminated as causative agents of this form of ichthyosarcotoxism. Fish most commonly involved are seabass or grouper, barracuda, snapper, parrotfish, wrasse, surgeonfish, and various other types of reef fishes.

The time of onset and symptomatology of ciguatera varies greatly according to the person, species of fish, toxicity, and amount and portion of fish ingested. Tingling about the lips, tongue, and throat followed by numbness may develop immediately or at any time within a period of 30 hours after the ingestion of the toxin. The usual time interval for the development of symptoms is from 1 to 6 hours. The initial symptoms in some instances consist of nausea, vomiting, metallic taste, dryness of the mouth, abdominal cramps, tenesmus, and diarrhea, followed by perioral tingling and numbness. The muscles of the mouth, cheeks, and jaws may become drawn and spastic with a feeling of numbness. Generalized symptoms of headache, anxiety, malaise, prostration, dizziness, pallor, cyanosis, insomnia, chilly sensations, fever, profuse sweating, rapid weak pulse, weight loss, myalgia, and joint aches are frequently present. Victims usually complain of a feeling of profound exhaustion and weakness. The feeling of weakness may become progressively worse until the patient is unable to walk. Muscle pains are generally described as a dull, heavy ache, or cramping sensation, but on occasion may be sharp, shooting, and affect particularly the arms and legs. Victims complain of their teeth feeling loose and painful in their sockets.

Visual disturbances, consisting of blurring, temporary blindness, photophobia, and scotoma, are common. Pupils are usually dilated and the reflexes diminished. Frequently reported are skin disorders, which are generally initiated by an intense generalized pruritus, followed by erythema, maculopapular eruptions, blisters, extensive areas of desquama-

tion—particularly of the hands and feet—and occasionally ulceration. There may also be a loss of hair and nails.

In severe intoxications, the neurotoxic components are especially pronounced. Paresthesias involve the extremities, and paradoxical sensory disturbances may be present in which the victim interprets cold as a "tingling, burning, dry-ice or electric-shock sensation," or hot objects may give a feeling of cold. In regard to the paradoxical sensory disturbance, the classical case usually cited is that in which an American naval officer who was poisoned by eating an amberjack was later observed subconsciously blowing on his ice cream, which was "burning" his tongue, in order to cool it. Ataxia and generalized motor incoordination become progressively worse. The reflexes are diminished and muscular paralyses develop. There may be clonic and tonic convulsions, muscular twitchings, tremors, dysphonia, dysphagia, coma, and death by respiratory paralysis. The limited morbidity statistics show a case fatality rate of about 7 percent. Death may occur within 10 minutes, but generally requires several days.

In those instances in which the victim survives, recovery is slow and convalescence may be very prolonged, with extreme weakness, sensory disturbances, and excessive weight loss being the last symptoms to disappear. When patients have survived severe intoxication, complete recovery has required a period of several years. Several workers have reported cases in which the symptoms persisted for as long as 25 years. Individuals who have been severely intoxicated have stated that during periods of stress, fatigue, exposure, or poor nutrition, there is a recurrence of the myalgia and joint aches similar to those suffered during the original acute period of the disease (10).

Gempylid Diarrhea

Some of the gempylids or escolaras contain an oil within their flesh and bone marrow which has a pronounced purgative effect when ingested. Gempylid diarrhea (27) develops rapidly, and is said to be without cramping or pain. Since there are no other untoward effects, ingestion of the oil can hardly be con-

sidered as an intoxication in the usual sense of the word.

Treatment of Fish Poisoning

The treatment of fish poisoning is largely symptomatic. There are no specific antidotes, and an attack does not impart immunity. Gastric lavage and catharsis should be instituted at the earliest possible time. In many instances, 10 percent calcium gluconate given intravenously has given prompt relief, whereas in others it has been ineffective. Paraldehyde and ether inhalations have been reported to be useful in controlling the convulsions. Nikethamide or one of the other respiratory stimulants is advisable in cases of respiratory depression. In cases where excessive mucus production is a factor, aspiration and constant turning are essential. Atropine has been found to make the mucus more viscid and difficult to aspirate, and is not recommended. Oxygen by inhalation and intravenous administration of fluids supplemented with vitamins given parenterally are usually beneficial. If laryngeal spasm is present, intubation and tracheotomy may be necessary. In case of severe pain, opiates such as morphine, given in small divided doses, will probably be required. Cool showers have been found to be effective in relieving severe itching. Patients suffering from the paradoxical sensory disturbance should be given fluids slightly warm or at room temperature, as well as vitamin B complex supplements. Antihistaminic drugs will be found to be useful in the treatment of scombroid poisoning.

Prevention of Fish Poisoning

Scombroid fishes appear to be particularly susceptible to putrefaction and the development of toxic substances. Geiger has shown that the "histamine" content of the flesh of the Pacific mackerel, *Pneumatophorus diego*, increases from 0.9 mg. per 100 gm. of tissue to about 95 mg. per 100 gm. when kept at room temperature (20° to 25° C.) for about 10 hours (23, 29). In warmer climates scombroids should be promptly refrigerated or eaten soon after capture. Toxic scombroid flesh cannot always be detected by appearance. The toxin

content may be very high with little or no evidence of putrefaction. Scombrotoxic meat having a sharp or peppery taste should be discarded. If the whole fish is available the gills should be examined. Gills should be bright red and without evidence of off-odor. If there is the slightest evidence of putrefaction discard the fish.

If one eliminates scaleless fish from the diet there is no opportunity to come in contact with either tetraodontoids or moray eels, since both are without scales. In Japan, puffer fishes should be purchased from a first-class authorized restaurant having a licensed puffer cook. It is important that the individual preparing the food has a thorough knowledge regarding the fish and its toxicity. One can generally have this assurance by dealing only with the higher class restaurants. It is advisable to eliminate all of the visceral organs and skin from the diet regardless of the species. Although the testes are usually nontoxic, it must be kept in mind that this organ is frequently confused with the violently toxic ovaries, particularly during the season of the year in which the reproductive organs are in the dormant state.

Ordinary cooking does not inactivate the toxin. It may still be present in lethal quantities even when passed through a steam retort in the commercial canning process. The poison can be inactivated chemically by cooking the meat in a strong solution of sodium bicarbonate, ordinary baking soda, for a prolonged period of time. This latter technique also destroys the flavor of the fish and renders it useless for consumption.

Our knowledge regarding the toxicity of most species of tetraodontoid fishes, exclusive of Japanese forms, is exceedingly meager. We do know, however, that many of the tropical tetraodontoid species have produced violent death at one time or another. Unless a species is definitely known to be nontoxic, which is questionable even under the best of circumstances, all tropical forms should be eliminated from the diet.

If it is a question of survival—either eat the puffer or die—and the edibility of the fish is unknown, it is recommended that the fish be eviscerated promptly, and only the musculature be used. Moreover, the meat should be

cut or torn into small bits, and soaked in water for a minimum of 3 or 4 hours. During this period the flesh should be kneaded while in water, and the water changed at frequent intervals. The toxin is water-soluble and leaching will effectively remove it.

In dealing with potential ciguatera type fishes it should be kept in mind that the most reliable methods of determining edibility involve the preparation of tissue extracts which are injected intraperitoneally into mice, or feeding samples of the viscera and flesh to cats, dogs, and observing the animals for the development of toxic symptoms. Viscera, that is, liver and intestines of tropical marine fish should never be eaten. Also, the roe of most marine fish is potentially dangerous, and in some cases may produce rapid death. Fishes which are unusually large for their species should be discarded, particularly barracuda (*Sphyraena*), jacks (*Craneau*), and groupers (*Epinephelus*), during their reproductive season. If one is living under survival conditions and questionable fish must be eaten, it is advisable to cut the fish into thin fillets and soak them in several changes of water for at least 30 minutes. This will serve to leach out the poison which is readily water-soluble. Do not use the rinse water for cooking purposes. If a questionable species is cooked by boiling, the water should always be discarded. Again it should be pointed out that ordinary cooking procedures do not attenuate ichthyosarcotoxins.

Summary

Fish poisoning is a disease of antiquity. Fishes are believed to become poisons as a result of their food habits—feeding on marine algae. There is no evidence that plankton or radioactive substances are a factor in the production of the poisons. Poisonous fishes are largely circumtropical in their distribution. Toxin content is greatest in puffers during their reproductive season of the year, but this is probably not true of most other fishes. The distribution of the toxin within the body of the fish is subject to considerable fluctuation, but if the fish is poisonous, some of the poison will be present in the viscera in about 90 percent of the cases. Poisonous fishes cannot be detected by their appearance.

Fish poisoning should not be confused with bacterial food poisoning, with which it has no etiological connections. The overall incidence of fish poisoning is not known. There are eight clinical types of ichthyosarcotoxism recognized at present. With the exceptions of gempylid diarrhea and scombroid poisoning, all other types of ichthyosarcotoxism are characterized by neurotoxic symptoms. The treatment of fish poisoning is symptomatic. Little is known about the chemical and pharmacological properties of fish poisons.

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"Model" Law to Cut Poison Deaths

The American Medical Association's Committee on Toxicology has formulated a "model" law for the precautionary labeling of hazardous substances in commercial, household, and industrial chemical products.

The labeling would apply to hazardous substances defined as toxic, irritating, sensitizing, corrosive, flammable, explosive, or radioactive under customary or reasonably anticipated conditions of handling or use.

"Model" text would require declaration of hazardous ingredients and warning statements on the label and in the literature accompanying chemical products.

Requirements of the model law are:

- Labeling of all chemical products containing hazardous substances that are not now regulated.

- Applications of the same labeling standards to chemicals for domestic use and for export. (This will refute the common complaint that inferior standards apply to foreign customers.)

- Prohibition of re-use of food and drug containers bearing their original labels.

- Identification and warnings for strongly sensitizing chemicals which cause allergic or inflammatory reactions in living tissue on contact.

A significant departure in the new law is the deletion of the word "poison." Reference standards, based on animal tests, provide a more consistent and reliable index of poisonous properties than did the former label, according to the committee, not only because there are variations in existing legal limits for poison but also because there is a lack of agreement among scientists on a definition of the term.

Inadequate labeling of potentially harmful chemicals, the committee reports, has been a major handicap to a successful attack on the problem of accidental poisoning. Moreover, lack of information about hazardous ingredients may complicate or delay treatment in emergency situations.

The committee's work in formulating a model law was endorsed by various organizations such as the National Drug Trade Conference, the American Public Health Association, the Cincinnati Academy of Medicine, and the Pennsylvania Pharmaceutical Association.

Heart Disease

Following are two of the papers presented at a session devoted to heart disease during the September 1957 meeting of the American Statistical Association in Atlantic City, N. J.

Methods of Studying the Ecology of Coronary Heart Disease

MORTON ROBINS, M.S.P.H., and
ALFRED M. STEINMAN, M.D.

DURING the past 2 years we have witnessed a tremendous surge of interest in the ecology of coronary heart disease. A conference on the epidemiology of atherosclerosis and hypertension (1), a symposium on measuring the risk of coronary heart disease (2), and numerous papers and articles on this leading cause of death (3-5)—all have served to whet the appetite of both the medical and public health profession for more definitive data. The public is looking for widespread programs for control or prevention, but while our knowledge of coronary heart disease has increased and many leads on etiological factors have been obtained, preventive programs have not yet been recommended. Emphasis is still on the need for additional research into causation.

The development of coronary heart disease is

generally agreed to be the result of complex, unidentified interactions between the human host, with his variable susceptibility, either genetic or acquired, and his total environment.

The study of such interactions is called "human medical ecology" (6) or "scientific epidemiology" (7, 8). Ecology emphasizes the nature of multiple causation and seeks to integrate the diversity of factors involved in disease and to synthesize hypotheses on causation. The ecologic approach has rarely been used in epidemiological investigations of infectious diseases since these studies have been concerned principally with identification of the causative agent—the micro-organism. Interest in medical ecology was revived when epidemiological inquiry was broadened to encompass the non-infectious chronic diseases of unknown etiology. Thus, medical ecology and epidemiology are blood brothers.

The ecologic approach is new, complicated, and expensive. Because of the shortages of trained investigators—at times requiring a team composed of clinician, epidemiologist, biostatistician, and experts from the basic and applied sciences—only a small number of epidemiological studies are currently under way. There is therefore a need to examine our resources and choose our studies with circumspection.

Considering the variation in age-specific incidence rates, the difficulty of accurate diagnosis, and the chronic nature of the disease, which of the alternative methods of data collection is best

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sued to study causation? An evaluation of the various data collection methods may give some perspective in making a proper choice. A review of ecologic factors may also reveal opportunities for field studies.

Ecologic Factors

Coronary heart disease is ubiquitous, with increasing morbidity and mortality in both young and old. Physicians are able, to some extent, to treat the result of the disease, but they are unable to prevent it. Prevention must hinge upon a better understanding of the basic role that each of the many known, suspected, and as yet unknown factors play in the creation of a thrombus in a coronary artery which has become atherosclerotic.

Factors incriminated as causes of the disease have been identified or evaluated in monographs and texts on coronary heart disease (9,10). An excellent summarization of our current state of knowledge concerning the pathogenesis of the disease is found in a recent paper by Miller and associates (4), and in the report of the Conference on Epidemiology of Atherosclerosis and Hypertension (1). In order to serve as a backdrop for the discussion of study methods, a brief description follows of what we believe to be the factors which require special investigation.

Experimental studies designed to produce atherosclerosis deliberately in animals have led to implications currently being utilized in planning clinical studies in humans, for example, hormone and diet studies. However, the experimental lesions produced in animals are rarely associated with thrombosis, which leads to the suspicion that blood coagulability may be altered.

Another approach to identification of etiological factors is through correlative, fact-finding studies. In essence, most of these studies seek to establish the association of a given physical feature, habit pattern, or result of a physiological or chemical test with the presence of the disease.

The clinician is aware of certain seemingly hereditary factors which appear to be of some importance. Coronary heart disease is observed

more frequently in mesomorphs than in other somatotypes (11). In many instances, the disease is seen in each generation of a given family (12). This suggests the probability that certain basic differences—*anatomical, psychological, metabolic, or mechanical*—exist among members of such families as compared with other groups. This feeling is strengthened by the observation that a synergistic relationship exists between coronary heart disease and certain other diseases with familial concentrations, that is, diabetes, xanthomatosis, hypercholesterolemia, and hypertension (13, 14). These conditions are considered significant when present in males under age 40, and perhaps even more so, in females.

Since some people are nearly entirely free of atheromata while others have dramatic depositions, some basic metabolic defect must be suspected which produces the atheromatous substances. Atherosclerotic plaques may be formed not only in the coronary arteries but in the vessels of the brain, legs, and other body organs and sites. A further question arises from the lack of uniformity in the distribution of atherosclerosis—the presence of plaques at one site bears no necessary relationship to their presence or absence at other principal locations. In addition, in hens, estrogens inhibit the incidence of experimental coronary but not aortic atherosclerosis (15).

Other factors, categorized as environmental influences, also play a role. The effect of climatic changes, ultraviolet light, and smoking have been incriminated. Nutrition probably has an important relationship to the metabolic dysfunction possibly involved in the pathogenesis of the disease. However, specific dietary factors have not as yet been "validated." The relative role of physical activity and the reactions to mental, physical, and biological stress are other significant variables that need further study and quantification.

In regard to the direction of concentrated research in the future, the group of patients under age 40 with an accelerated form of the disease may provide the best source of information ecologically. How do those with manifestations of the disease differ from others in their genetic makeup and habit patterns, including

diet, occupation, mode of living, and associated disease? If significant differences are discovered, are they coexistent or correlated?

The answer to these and many other questions will lead to newer ones. These in turn will lead to the attack upon what we believe is the underlying process: a metabolic defect which produces either atherosclerotic or thrombotic changes, or both, in the coronary arteries, accelerated by such factors as diet, hormonal changes, and habit patterns.

Epidemiological Approaches

Let us now consider the epidemiological approaches in the search for causes of coronary heart disease. We can classify these methodologies into six broad categories: mortality data, hospital statistics, morbidity surveys, morbidity reporting, longitudinal studies, and selected patient cohorts.

Mortality Data

Information on death certificates has traditionally been analyzed to supply clues on statistical associations between demographic characteristics of the population and the incidence of disease. Inferences from analyses of mortality figures have often been substantiated by findings from other epidemiological studies. A large number of statistical studies of coronary heart disease mortality data have been made, and significant differences have been reported for such factors as age, sex, marital status, income, occupation, ethnic group, height, and weight (1). The relationship between dietary fat consumption and coronary heart disease mortality reported by Keys has recently been challenged by Yerushalmy and Hilleboe (16).

It has been suggested that mortality analyses should be pursued because the source data are readily accessible and the study costs are low compared with other epidemiology approaches (1). Moreover, more intensive studies can be designed to increase the epidemiological significance of observed mortality differentials. These mortality studies would start with facts on death certificates and then add information by means of field investigations or by questionnaires to the attending physician and rela-

Guide for Avoiding Arteriosclerosis

A statement advising laymen on how to resist arteriosclerosis, coronary thrombosis, and brain thrombosis has been issued by the National Health Education Committee, Inc., of New York City.

According to the physicians who signed the statement, Dr. Paul D. White, Dr. Howard B. Sprague, Dr. Samuel A. Levine, and Dr. Frederick J. Stare, all of Boston, there are five predisposing factors. They are listed as heredity, overweight, elevated cholesterol level, elevated blood pressure, and excessive cigarette smoking. Hard work in itself, they maintained, cannot be considered a factor.

Persons with a strong hereditary background of arteriosclerosis are particularly cautioned to minimize the effects of the other factors.

The statement lists a number of documents referring to the factors listed. Stressing the importance of arteriosclerosis of the heart and brain, the statement noted that heart and circulatory disease caused the largest number of deaths in the United States. Of the 843,410 deaths in 1956 in this category, most were due to arteriosclerosis.

tives of the decedent. In addition to gathering facts on events leading to death, the studies might provide valuable information on the accuracy of cause of death certification. More profitable coronary heart disease mortality data can also be derived from studies in selected localities where death certification practices are believed to be fairly uniform and accurate.

The major weaknesses of mortality statistics on coronary heart disease as a source of ecologic data are: first, variation in the completeness and accuracy in medical certification of deaths due to the disease; second, questionable correlation between specific mortality rates and incidence of the disease; and third, the impossibility of analyzing from routine tabulations of mortality data many of the ecologic factors believed to be significant in the pathogenesis of the disease.

Accuracy and completeness of cause of death certification depend on the quantity and quality of available physicians' services, and vary with concepts held by physicians concerning the

manifestations of coronary heart disease. These differences in death reporting practices in various subgroups of the population can alter the actual association of coronary heart disease mortality and a particular demographic characteristic (17). Yerushalmy and Hilleboe's study of heart disease mortality statistics for different countries indicates that large numbers of coronary heart disease deaths are reported variably, and are classified as "degenerative heart disease" or as "other diseases of heart" (16).

A basic epidemiological question is whether differential mortality can be used as an index of the relative incidence of initial coronary heart disease attacks among specific population groups, since the disease is chronic and most initial attacks are not fatal. Attacks often recur over a period of many years before the fatal attack occurs. Thus, the age distribution of deaths from the disease may be markedly different from that of patients having an initial attack. Moreover, survivors of an initial attack frequently change their occupation to compensate for their residual disability or from fear of physical exertion. These facts should be recognized in evaluating the epidemiological significance of the mortality differentials of the disease by age, income, occupation, socioeconomic status, and place of residence.

Notwithstanding their limitations, mortality data provide an index of the size and seriousness of the problem. In the absence of specific morbidity and case fatality data, analyses of mortality trends supply indirect evidence of changes in incidence or advances in therapeutic procedures.

Hospital Statistics

The growth of hospital facilities accompanying the expansion of hospitalization insurance coverage and medical care for indigents suggests the increased usefulness of hospital statistics as a measure of coronary heart disease morbidity. Some merit is attached to proposals for a statistical study of coronary heart disease admissions or discharges from a group of hospitals that supply all the inpatient care requirements of a particular area. An example of integrated hospital statistics for a known population is provided by the experience of the

Saskatchewan Hospital Services Plan (18). In the United States, the Commission on Professional and Hospital Activities, Inc. (Ann Arbor), has assembled detailed statistics on patients discharged since January 1, 1953, from hospitals comprising the Southwestern Michigan Hospital Council.

Hospital statistics are considered by some to represent, at worst, a compromise between mortality statistics and complete morbidity data. Extensive hospital morbidity surveys were conducted in New York City in 1933 (19), in Oxford, England, in 1948 (20), and in Ontario, Canada, in 1951 (21). More recently, a large pilot study was conducted in New York City to demonstrate the feasibility of a hospital reporting system as a source of providing useful information on morbidity and for planning medical care programs (22).

While the data on coronary heart disease in tabulations of hospital records suggest differentials in morbidity, their validity has not been ascertained. The question still unanswered is whether the differentials in hospital admission rates are comparable to those based on total incidence of coronary heart disease according to sex, age, race, occupation, and other demographic characteristics. Studies are needed to correlate hospital statistics for a community with estimates of morbidity. In such studies analysis should be made separately for each of the manifestations of coronary heart disease, that is angina pectoris, abnormal electrocardiogram not related to other disease states, and myocardial infarction. Until these questions are answered, indexes of morbidity from hospital admission rates require confirmation by other epidemiological studies.

Detailed clinical, laboratory, and medical history data on hospitalized coronary heart disease patients may also supply leads for other statistical associations related to ecologic factors.

Morbidity Surveys

Morbidity surveys on the health status of a population may take two forms: interviews in sample households, or a complete canvass of physicians and hospitals in a community.

To our knowledge, such a complete survey of physicians and hospitals has not been applied

to the study of coronary heart disease morbidity, but it has been used to obtain morbidity data on cancer. The canvass method is expensive and requires protracted negotiations with medical societies, hospital associations, and health departments. Although the method has been practicable occasionally for cancer morbidity surveys, its results would be highly questionable when applied to coronary heart disease. As contrasted with cancer where pathological laboratory records, hospital records, and mortality reports form a large part of the total morbidity picture, the canvass method applied to coronary heart disease morbidity would rely primarily on reports by cooperating physicians. Retrospective reporting of coronary heart disease is not, therefore, likely to yield a complete picture of its incidence during a prior year.

Morbidity surveys using data from household interviews of a scientifically selected sample of a community, a State, or the Nation have provided epidemiological data on coronary heart disease. An appraisal of heart disease morbidity derived from the National Health Survey of 1935-36 was made by Collins (23) in 1949. More recently, findings have been reported based on morbidity surveys conducted in Hunterdon County, N. J. (24), Baltimore, Md. (25), and the State of California (26). All of these reports generally agree on the uncertain validity of the computed prevalence rates for such chronic diseases as coronary heart disease. Incidence rates derived from data obtained in household surveys are even more tenuous.

Comparisons of coronary heart disease prevalence as measured by household interviews and clinical examinations indicate that the interview data provide minimum estimates. It would also appear that the reported prevalence rates for various subgroups of the surveyed population are subject to varying correction factors of uncertain magnitude.

Despite these limitations, valuable demographic and epidemiological data are byproducts of household morbidity surveys. Estimates are obtained of ecologic characteristics not otherwise available. Such data are useful in assessing concurrent data from morbidity reporting projects, and hospital and mortality studies of the same community. The survey

may also supply rosters of individuals presumably free of coronary heart disease. These randomly selected persons can serve as controls for study patients identified by other study methods.

Morbidity Reporting

Ideally, voluntary reporting by physicians of all new cases of coronary heart disease as they are diagnosed provides the cheapest and most direct approach for acquiring data on incidence. In an appeal in 1930 for voluntary reporting by New York State physicians of certain facts relating to heart disease, Dr. J. V. DePorte, of the New York State Department of Health, said, "In this day, when the immutability of even chemical elements is no longer an axiom, the rigid grouping of diseases into communicable and noncommunicable seems to be altogether artificial. . . . A group of diseases which incapacitate about 300,000 persons in the State is certainly a matter that cannot be excluded from the field of legitimate public health activities by the mere fiat of our individualistic tradition (27)." No action was ever taken on his proposal.

In 1956, Dr. P. D. White called attention to the increased collaboration between the epidemiologist, the cardiologist, and the family doctor as illustrated by their participation in an epidemiological survey of coronary heart disease in the Grand Forks, N. Dak., area (28). During this survey all physicians in the area notified a central committee of each new case of coronary heart disease diagnosed. The reports were supplemented by a household survey giving descriptive data of the population in terms of ethnic background, diet, exercise, habits, stress, smoking habits, and other characteristics. Rosters of the surveyed group are matched against cases of coronary heart disease reported and act as controls in followup studies of both groups. A similarly organized study started in January 1956 in Middlesex County, Conn.

Despite this and other evidence of increased community and physician interest in coronary heart disease, it does not appear likely that voluntary reporting is a practical approach in many localities.

More realistic perhaps is the use of this ap-

proach to determine the incidence of coronary heart disease among more circumscribed groups. Valuable ecologic data can be assembled, for example, on persons covered by comprehensive medical care programs where both physician services and medical records are integrated.

Longitudinal Studies

In prospective or followup studies of coronary heart disease, a cohort of the general population, considered to be free of the disease, is observed over a long period of time to determine the natural history of the disease process. Information is sought on signs or symptoms considered to be precursors to clinical manifestations of the disease. The incidence of conditions can be related to multiple characteristics of the study population which are ascertained by interview, medical examination, or diagnostic tests. Prognosis can be measured in terms of progression of clinical signs and symptoms with reference to the characteristics of each case. In a longitudinal study, provision can also be made after the study has started to introduce a new study variable meriting investigation.

The major limitations of longitudinal studies are: (a) technical difficulties in organizing the study and high costs over the long period required for data collection; (b) attrition of the study group due to noncooperation or movement out of the study area; (c) change of observers throughout the course of the study; and (d) changes in the normal living patterns of the study subjects when they are conscious of the existence of precursors to clinical coronary heart disease.

The first two limitations lead to the question of how to select the study population. Should the study group be a sample of the general population? Or should the study group include all or a sample of a specially constituted group? Obviously, study of the general population permits more valid generalization. However, studies of specially constituted groups, such as industrial employees, Veterans Administration beneficiaries, and participants of pension, disability, or health insurance plans, have the advantages of lower attrition rates and greater cooperation of the study

group. Moreover, study costs are appreciably lower, since medical and laboratory facilities are available and medical records are generally maintained for other medical care purposes.

While selection factors may be present with such variables as age, sex, race, activity status, and income, the observed experience of selected groups can be adjusted by available biometric techniques. In this connection, approximately the same average annual incidence of coronary heart disease, 7 per 1,000, was observed among male civil service employees in the age group 40-54 in Albany, N. Y. (29), and in Los Angeles, Calif. (30), as was found in a sample of the total male residents of Framingham, Mass. (31), in the same age group.

Selected Patient Cohorts

Coronary heart disease patients, or persons having a disease believed to be synergistic in the pathogenesis of heart disease, provide special cohorts for ecologic study. Ideally, these study groups should be scientifically selected from the general universe of patients with the disease. Practical considerations, however, commonly lead to a decision to select hospitalized patients or outpatients as a study unit.

How representative such a group is of the general class of patients from which it is drawn and the methodology of the study plan are concerns of the statistician. The restrictions on the interpretation of findings and the procedures necessary to avoid either erroneous or spurious statistical associations have already been described by Berkson (32), Kraus (33), Lilienfeld (34), and Moore (35). With proper concern for the study design, patient cohorts furnish excellent case material for the study of metabolic defects and specific environmental influences as they relate to the incidence of coronary heart disease.

Retrospective study of coronary heart disease cases generally consists of inquiry into their medical history for suspected antecedent events. Comparison with similar data from a control population provides an indirect method for estimating differential incidence rates. However, when hospitalized patients are used as the study group, the validity of procedures for estimating relative risks (36) is dependent on the degree to which the hospital patients

and the selected controls are representative of these same groups in the general population.

Generally speaking, the longitudinal rather than the indirect approach is recommended for the study of diseases with relatively high incidence. While the total incidence of coronary heart disease is considered to be sufficiently high for longitudinal studies, the incidence among adults under 40 years of age has been found to be so low that the use of the retrospective approach is suggested for this age group. The study of coronary heart disease among these young adults, particularly those without evidence of hypercholesterolemia, hypertension, or diabetes, is of special ecologic interest. This group of patients represents an accelerated form of atherosclerosis.

"Recovered" coronary heart disease patients also serve as cohorts for prospective studies to evaluate the effectiveness of control or prophylactic measures in preventing recurrent attacks. These exploratory studies may provide an understanding of at least one of the components of the causative complex. The advantages of using a cohort of patients instead of a sample of the general population are fairly obvious.

Prospective, longitudinal studies of individuals considered to be particularly susceptible to coronary heart disease, such as diabetics and hypertensives, should also be pursued more intensively than in the past. The size of such cohorts need not be as large as those for longitudinal studies of the general population since the expected differential incidence rates are higher. Moreover, longitudinal studies of these patient groups may possibly suffer from less attrition because of greater interest in their disease. Determination of the environmental factors which trigger symptomatology among these highly susceptible individuals would add significantly to our understanding of the ecology of the disease.

Summary

Public health authorities, who are confronted with the task of reducing the incidence of coronary heart disease, must base their policies and programs on knowledge of the causes. A review of ecologic factors indicates that fu-

ture preventive programs will probably be related to the control of the causes of coronary atheroma and of the environmental influences which accelerate atheromatous depositions and coronary thrombosis.

Epidemiological data are needed to define the differential incidence of the disease among persons with different characteristics and living under different environmental conditions. Such data, when added to pertinent knowledge derived from clinical sources, animal experimentation, and laboratory sciences, will eventually enable the medical ecologist to synthesize a pattern of the multiple causative factors involved.

From this review it is evident that no one all-encompassing field study is likely to settle the epidemiology of coronary heart disease. Significant evidence on causation can be derived from one approach which is not within the capabilities of another. However, because of the short supply of technicians needed for epidemiological research, it is necessary to proceed piecemeal in order to fill the important gaps in our knowledge.

Hypotheses should be intensively investigated by the most rigorous epidemiological method available, despite known limitations in our ability to generalize from the findings. This recommendation does not imply indiscriminate collection of information nor disregard for the principles of validity and reliability.

Three approaches are suggested for future epidemiological studies of coronary heart disease:

1. Routine reporting for a limited time period of initial manifestations of coronary heart disease among adult populations whenever practicable.

2. Longitudinal studies of selected groups whose physical, physiological, and psychological characteristics are determined at the beginning of the observation period.

3. Retrospective and prospective studies of patient populations to determine the relationship between underlying metabolic defects and environmental influences and the incidence of coronary heart disease.

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proach to determine the incidence of coronary heart disease among more circumscribed groups. Valuable ecologic data can be assembled, for example, on persons covered by comprehensive medical care programs where both physician services and medical records are integrated.

Longitudinal Studies

In prospective or followup studies of coronary heart disease, a cohort of the general population, considered to be free of the disease, is observed over a long period of time to determine the natural history of the disease process. Information is sought on signs or symptoms considered to be precursors to clinical manifestations of the disease. The incidence of conditions can be related to multiple characteristics of the study population which are ascertained by interview, medical examination, or diagnostic tests. Prognosis can be measured in terms of progression of clinical signs and symptoms with reference to the characteristics of each case. In a longitudinal study, provision can also be made after the study has started to introduce a new study variable meriting investigation.

The major limitations of longitudinal studies are: (a) technical difficulties in organizing the study and high costs over the long period required for data collection; (b) attrition of the study group due to noncooperation or movement out of the study area; (c) change of observers throughout the course of the study; and (d) changes in the normal living patterns of the study subjects when they are conscious of the existence of precursors to clinical coronary heart disease.

The first two limitations lead to the question of how to select the study population. Should the study group be a sample of the general population? Or should the study group include all or a sample of a specially constituted group? Obviously, study of the general population permits more valid generalization. However, studies of specially constituted groups, such as industrial employees, Veterans Administration beneficiaries, and participants of pension, disability, or health insurance plans, have the advantages of lower attrition rates and greater cooperation of the study

group. Moreover, study costs are appreciably lower, since medical and laboratory facilities are available and medical records are generally maintained for other medical care purposes.

While selection factors may be present with such variables as age, sex, race, activity status, and income, the observed experience of selected groups can be adjusted by available biometric techniques. In this connection, approximately the same average annual incidence of coronary heart disease, 7 per 1,000, was observed among male civil service employees in the age group 40-54 in Albany, N. Y. (29), and in Los Angeles, Calif. (30), as was found in a sample of the total male residents of Framingham, Mass. (31), in the same age group.

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Some Observations on the Epidemiology of Heart Disease

TAVIA GORDON

CERTAINLY, the problems in studying heart disease are complex and difficult. To discuss them in detail is obviously impossible here. I will therefore confine myself to a few simple observations.

The first is that the study of heart disease is to a considerable degree still a study of deaths. All too often the first indication we have that a person's coronary artery isn't all it ought to be is when he dies. The final evaluation of an attack of coronary artery disease requires an analysis of changes in the coronary artery and this can be done only by autopsy. There is no equivalent to the biopsy in the study of heart disease.

The second observation is that we must make a distinction between the age group under 65 and the age group over 65 years. When we speak of the alarming increase in heart disease in this country we are referring to the rise in mortality among white men aged 45-64. When we speak of the difficulties of diagnosis we are referring primarily to events after age 65 and

secondarily to events among middle-aged women, which are apt to be equivocal.

The study of heart disease among old people is really for the future. I doubt whether medical science is far enough advanced at present to adequately describe the complexity of chronic illness at advanced ages. Medical pathology is certainly of little help. Usually, the pathologist's report clearly indicates that the person was extensively diseased; the wonder is that he lived as long as he did; but it is difficult to delimit from the multiplicity of defects present any specific, well-defined etiology. Nor is the clinical picture much more help. As has been pointed out, all the organ systems fail at death—the lungs, the liver, the kidneys, and so forth, as well as the heart—but in the absence of a clear-cut etiology the failure of the heart will tend to dominate the picture. If, however, we confine our attention to the study of coronary artery disease among middle-aged men I think we are in a good position to tag our cases and to investigate the epidemiology of the disease.

Unfortunately, vital statistics has gotten itself into a dilemma in the reporting of deaths among older people. If a doctor, faced with a complex and poorly defined pathology, reports a death as due to "old age," the local registrar will in all likelihood request a more definite cause of death. Any student of medical ecology knows what happens next. After a while the doctor starts giving definite answers even when he has only the vaguest notion of the cause of death. And then, of course, the vital statistician becomes understandably skeptical about the reporting of cause of death.

This skepticism about the reporting of cause of death, which is practically an occupational disease of vital statisticians, seems to me grossly exaggerated. I think much of it would evaporate if the skeptics ever attempted to reassign the deaths attributed to heart disease. There are just too many of them. Either they represent a substantial reality or some other diseases represent a public health problem of much greater magnitude than anyone has previously suggested.

It must be granted that the difficulties in the reported death statistics are considerable, but few of them can be resolved by contemplation.

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easier. About all you can do that is worth doing is to find out as much about the nonrespondent group as possible. Prospective studies have some advantages in this regard, because there is a reasonable expectation that after a group has been followed for a time the initial bias will tend to diminish, but there is no gainsaying that reliable estimates of the prevalence of cardiovascular conditions in the general population are going to be hard to come by.

Unfortunately, the morbidity survey, which has proved useful in getting prevalence data for many diseases, has not worked out very well for the chronic diseases in general or for heart disease in particular. Contrary to some im-

pressions it is neither cheap nor easy. What is worse it is exceedingly ineffective in identifying persons who would be considered to have heart disease on the basis of a careful clinical examination. No one will dispute that all available epidemiological techniques ought to be considered for the study of heart disease, but there is little advantage in dispersing our substance in a search for shortcuts. This is a real hazard: We are all impatient for answers to our questions about heart disease, and the routine clinical devices for accumulating pertinent epidemiological information are painfully slow and laborious. But here, as elsewhere, the slow and careful way may yet prove the quickest.

Shaw Promoted to Assistant Surgeon General



Dr. James R. Shaw, chief of the Public Health Service's Division of Indian Health, has been promoted to the grade of Assistant Surgeon General.

When the Public Health Service took over the Indian health program from the Department of the Interior in 1955, Dr. Shaw was made chief of the newly created Division of Indian Health. In that capacity, Dr. Shaw is responsible for the administration of medical and public health services for approximately 380,000 American Indians and natives of Alaska.

A career officer of the Public Health Service, Dr. Shaw has been commissioned since 1938. After assignments in Public Health Service hospitals and the U. S. Coast Guard, he became medical officer in charge of the U. S. Marine Hospital, Detroit, in 1949. In 1952 he was named chief of the Service's Division of Hospitals and served in that post until he began his duties in Indian health in 1953 with the Department of the Interior.

In particular, rules of internal consistency for mortality statistics seem to me very slippery. If the mortality sex ratio is high among the white population and low among the Negro population, it may be simply that the death rate for arteriosclerotic heart disease is higher among Negro women than among white. We know that serious arteriosclerotic heart disease is very uncommon among middle-aged women unless they have diabetes or some similar metabolic defect. Conceivably such conditions are more common among Negro women than white. Mortality statistics certainly suggest that. Similarly, mortality sex ratios for arteriosclerotic heart disease are much lower in some countries than they are here. Does that mean those countries are reporting some other disease? Or does it mean that there is a real difference in the balance of factors controlling the appearance of the disease? The suggestion of Edward A. Lew of the Metropolitan Life Insurance Co. that there is a strong environmental component in the sex differentials for arteriosclerotic heart disease seems well taken. I think it is also true that there is an environmental component in the age differentials for this disease.

The question of what factors are involved in the development of coronary artery disease, which is the question that epidemiological studies in this field are concerned with, is a very vexed one. Numerous factors have been implicated, with or without evidence, but none of the really important issues has yet been settled. This is not peculiar to heart disease, however. All diseases may be said to involve a complex interrelation of factors, but the use of a simplified approach still has an obvious utility in the investigation of these factors. It is certainly not necessary that all of the critical factors be recognized or understood for a disease to be controlled, and it is conceivable that one or another of the presently considered factors may provide the key to the control of heart disease. Perhaps diet will prove to be that critical factor. Certainly, there is an increasing weight of evidence suggesting this possibility.

Unfortunately, it has become increasingly difficult to make epidemiological studies of diet in the American population. More and more people are dieting, think they are dieting, or

think they ought to be dieting, and as a result their account of what they eat is apt to be confused and unreliable. In such circumstances the controlled nutrition experiments become more and more critical for our understanding of the role of diet. Currently, such experiments most frequently take the following form: some factor or factors, usually the kind of fat, are manipulated within a more or less carefully controlled regimen, while the remainder of the diet is kept the same or adjusted to maintain a constant caloric intake. The effect of this is measured by some index—total cholesterol or some other serum lipid, usually, since there is some evidence that the serum lipids are associated in a rough way with the risk of overt coronary artery disease.

In this kind of investigation the statistician can be of considerable assistance in designing economical inquiries and rationalizing their results. The usual result of these experiments is that the index goes up and down as the diet is altered, but there are no clear-cut criteria for deciding when the effect of one regimen has given way to the effect of another or (put another way) when we have reached an index level characteristic of a specified regimen. How do you decide when you have reached a steady state and when do you decide that this steady state is not transitory? Furthermore, there are individual differences in response, and while these are no doubt very important they are difficult to evaluate. At the moment this is a very complex but a very promising area of research.

Investigation of other factors in heart disease epidemiology can, at this stage, still be undertaken by field studies. The most serious problem in such studies is the low level of response. You are lucky to get two-thirds of any reasonable sample you select to participate in your study. No one seems to have turned up a way of improving the situation. Going to special groups, instead of to a general population sample, does not seem to help. Captive populations are much less cooperative than might be expected.

The problems of bias arising from nonresponse are certainly serious; and admitting them, unfortunately, does not make them any

ditions of life as an essential part of the United Nations system.

Twin Contrasts

Hours could be spent in elaboration and illustration of any one of these points. I particularly wish to discuss some aspects of the last point—the basic importance of the World Health Organization in raising health levels and creating more stable conditions of life.

Today, we face staggering contrasts. In a few short decades, a minority of mankind, mostly in North America and Western Europe, have almost conquered major communicable disease and have prolonged the span of life so that now the problems and diseases of old age loom large before us. At this very same time, one-seventh of mankind suffer from trachoma, perhaps one-quarter are infested with intestinal parasites; one-tenth still suffer from malaria each year; the dysenteries, often fatal, especially in young children, are too prevalent for calculation.

This type of contrast symbolizes, in the field of health, the vast gap which separates the conditions of life in economically developed countries from those in the rest of the world. The medical science and the technology now exist to conquer these diseases, yet for only a minority of mankind have they been truly conquered. For the first time, peoples in nearly all economically underdeveloped areas are acutely aware that, for some, ill health is not a normal condition of life and, furthermore, that it need not be.

But there is another contrast. On the one hand, there is around the world an insistent demand for health. Consequently, the nations, working cooperatively through the World Health Organization, are beginning to be really successful in the mass applications of the recently developed modern knowledge of the means to health. These applications are ways to the kind of life where human potentialities can be realized; where hunger, disease, and ignorance do not drag man down in his ascent from levels of animal existence. Yet at this very same time, man has made vaulting strides, terrifyingly rapid, in developing the means of mass destruction. These are means which, when

wrongly used, can serve the passions of hate, fear, and the lust to dominate.

These twin contrasts—between conditions of life for a minority of mankind and for a majority and between the technology of human welfare and the technology of destruction—define, in my opinion, the context in which we must now view the importance of the World Health Organization to Americans and to the world. The technical means to health and the organizational means by which nations cooperate to realize health fully form a priceless counterpoise to help balance these contrasts.

Areas of Common Interest

Thirteen years ago, the 73d annual meeting of the American Public Health Association heard an unusual address. Two years before the International Health Conference, it defined forcefully and incisively the basic meaning and value of an organization such as WHO. As so often in the evolution of public health programs, national or international, the Rockefeller Foundation, in the form of this address by its top official, seemed to be lighting a path for others to follow. In speaking on public health as an international problem, Dr. Raymond B. Fosdick, then president of the Foundation, declared:

"The community of nations has got to have a kind of intellectual and spiritual integration before it can be absolutely sure that the forces of violence are under control. Consequently there must be developed for international life new areas and techniques of cooperative action. . . . We need rallying points of unity, centers around which men of differing cultures and faiths can combine, defined fields of need or goals of effort in which by pooling its brains and resources the human race can add to its own well-being. . . ." Dr. Fosdick saw hope only "as we begin to build, brick by brick, in these areas of common interest where cooperation is possible and the results are of benefit to all. . . ."

Public health, he said, can be an important area of common interest, a rallying point of unity. This is my view, and I believe it was the view of the health experts directly responsible for founding the World Health Organiza-

The Importance of WHO to Americans

SURGEON GENERAL LEROY E. BURNET

I AM GRATEFUL to the National Citizens Committee for the World Health Organization for the opportunity to say something today about the importance of the World Health Organization to Americans. My remarks here will be rather in the nature of a personal statement—the impressions and reflections of one who is a relative newcomer to active association with WHO. Of course, my belief that WHO is important existed even before my first attendance at a World Health Assembly, the Eighth, held in the colorful setting of Mexico City in 1955. This conviction was accentuated by attendance in 1957 at the Tenth World Health Assembly in Geneva, the headquarters of the Organization. At this Assembly, I had the privilege of heading the United States delegation. Having to exercise responsibility during the Assembly for the effective and proper presentation of United States views is one of the best ways of necessitating a clear hard look at WHO programs and policies.

I did not find such a look disappointing. The World Health Assembly is genuinely an impressive meeting. The delegates, representing most of the countries of the world, give serious consideration to the world's pressing health needs and how they can be met, resulting in tangible decisions directly affecting the health of millions of human beings such as the decision to drive for eradication of malaria from the world. The Assembly provides unique opportunity to exchange views and to

establish friendly relations with the health leaders of other nations. This is the essence of communication—both more ready interchange of technical information and more international understanding, which basically is understanding between individuals. A further development of the ties between Americans and health leaders in other countries is one among many reasons why I am delighted that the Assembly in May 1958 will be held in the United States.

Any realistic accounting of the benefits which Americans derive from United States membership in, and support for, WHO must include the following:

- Protection against importation of disease through almost universal application of the International Sanitary (quarantine) Regulations.
- Protection of the health of United States citizens traveling abroad through these quarantine measures and through control of diseases at their source.
- Stimulation of markets for United States products and lowering of prices of United States imports through reduction of the enormous drag of disease on economic productivity in many parts of the world.
- Making available to the United States, for application here, the latest health and medical advances in other parts of the world.
- WHO stimulation and correlation of such technical advances and of research.
- Friendship for, and in many cases direct acquaintance with, the United States among health leaders—leaders who are often influential in their own countries outside the field of health.
- WHO leadership in helping countries raise health levels and create more stable con-

This is the keynote address given at the annual meeting of the National Citizens Committee for the World Health Organization, Hotel Cleveland, Cleveland, Ohio, November 13, 1957.

and techniques of cooperation which have proved so rewarding here—techniques of a free society.

These techniques of cooperation, indeed, involve not only WHO and national governments, but extend through them to a multitude of health experts and institutions within countries. The WHO Influenza Study Program is an example of great current interest. In this program, WHO has brought about organized cooperation between laboratories in many countries, which collect, study, and report on influenza virus strains. WHO gives small grants to a World Influenza Center in London and to the International Influenza Center for the Americas, operated by the Public Health Service in Atlanta, Ga., as focal points in this program. In the United States alone, 60 different laboratories cooperate.

Through the program, which also includes the essential participation of a WHO panel of experts around the world, there is constant worldwide watch on the appearance and spread of influenza epidemics and rapid identification of responsible strains. Owing in part to this WHO Influenza Study Program, we in the United States were alerted to the 1957 epidemic and were able to prepare for the invasion of the new strain through production of a protective vaccine.

The world, while now so interdependent, is still a large place. WHO makes use of a decentralized regional structure to an extent unique in international organization. I believe that this decentralization has considerably strengthened WHO as an instrument through which nations cooperate for health. Through the regional offices and regional committees, WHO is brought closer to the needs and governments of member countries, and they closer to WHO. When I recently attended the meeting in Hong Kong of the WHO Regional Committee for the Western Pacific, it was clear that the health leaders of that part of the world and the WHO staff are good friends and work closely together in defining needs and planning programs in health.

Moreover, the decentralized regional structure makes possible more flexibility and experimentation in the WHO programs. An example of a worthwhile experiment is the es-

tablishment of the Institute for Nutrition of Central America and Panama. Under the aegis of the Pan American Sanitary Bureau, the WHO Regional Office for the Americas, and supported largely by the Central American republics, this institute has attained a worldwide influence in nutrition.

Comparison with our own national experience, then, shows that WHO and the nations are evolving a pattern of cooperation along lines to which all Americans can wholeheartedly subscribe. In its sphere, WHO is becoming a "rallying point of unity." With the clearly defined need and goal of health in mind, men and nations of differing cultures and faiths are combining their efforts.

During the past year, some of the Soviet group of countries have resumed active membership in WHO. Even without their participation, WHO has already accomplished a great deal. The eventual character of renewed active membership by these countries remains to be seen. If, in the long haul, it turns out to be a real working together with other nations for health, this would considerably enhance the significance of WHO, as a pattern of cooperative action, applying the technology of human welfare. In such circumstances, the World Health Organization and associated international technical agencies might, given time, contribute more than we realize to bringing the forces of conflict into balance. It is our hope, and our imperative need, that this will be so.

Epilogue

I have given you some of the reflections of a relative newcomer to active concern with WHO affairs. After these reflections had been put on paper, I listened the other night to the President's address to the Nation on science in national security. In concluding his address, Mr. Eisenhower referred to the peaceful uses of science, naming specifically the contributions of science to healing as one of the most important products of the conquest of nature's secrets. Speaking for us all, he said that we will never cease to work for the day when the scientist can give his full attention, not to human destruction, but to human happiness and fulfillment. My theme today has been that

tion. All nations want health, and no nation in the process of gaining health takes it from another—rather, thereby, it helps to advance health everywhere.

This notable address listed activities which a new international health agency might profitably pursue. It is impressive for me, and hopeful, that the list was an accurate preview of WHO's present far-reaching activities: a worldwide epidemic intelligence system; the standardization of biological products; the organized exchange of public health personnel to broaden the technical outlook and stimulate the imagination of health officers; the supplementation of public health activity in countries where it is inadequate; the development of minimum standards of acceptable public health work that can be applied on a worldwide basis; the creation of expert committees and international conferences on special subjects.

These are all activities which, among others, WHO has inherited or initiated, expanded, and made markedly successful in 10 years. They represent the organized cooperative application, worldwide, of the swiftly developing modern technology of health—tangible interrelated action by most countries in the interests of all.

In September 1957, I had the opportunity to see for myself some of the progress in health being made in countries in the Pacific and Asian areas. I found fundamental changes taking place in these countries. Many of them, for example, are establishing spreading networks of rural health centers, which are the basic units of public health protection in that part of the world. During my all-too-short visit to that hospitable country, the Philippines, I saw several such centers. These rural centers, built largely by the efforts of the people in the villages, are so impressive that I confessed to my hosts that they are even better than many of our own here in the United States.

It is evident that in health most of the nations have indeed found an area of common interest. They have begun to build, brick by brick, expanding the techniques of cooperative action. In the context of today's world, this process, associated with international cooperation in other fields, such as education and agriculture, holds out hope. It is lessening, though

slowly, the stark contrast in conditions of life; it is demonstrating incentive and ability to apply science for man's common benefit.

In viewing this essential value of the working of WHO, I have noticed how familiar many of WHO's techniques and modes of operation seem to be. Almost my whole professional life has been spent in the area of domestic inter-governmental health relations within the United States—as a State health official, working in cooperative relationships with Federal agencies, with other States, and with local and voluntary agencies; and as a Public Health Service official, in cooperative relationship primarily with the States, and with the same wide range of other organizations.

Through these effective working relations, we have built in the United States a true community of health effort.

On the plane of international intergovernmental health relations—the relations between WHO and member countries—the same trends are evolving. WHO's interrelationships with member countries seem familiar because, on reflection, they are in many respects quite similar to our relationships in technical matters between Federal and State health agencies. WHO's relationships with other United Nations specialized agencies and international voluntary organizations also remind me of our patterns of cooperation.

Techniques of a Free Society

The member nations of WHO are, of course, independent countries. Even though this is true, the pattern of technical relationships established between WHO and these countries contains the following elements which have a familiar ring to us.

WHO provides expert consultation and assistance to member nations. It develops and demonstrates public health methods which are new, or new to the nations concerned. It stimulates cooperative action among nations on problems requiring such action. And in annual regional and worldwide meetings, the evolving health needs and the future shape of health programs are determined. Through WHO, the nations are succeeding in building on a world scale many of the interrelationships

Arthropod-Borne Encephalitis in 1956

E. RUSSELL ALEXANDER, M.D., and WALTER A. MURRAY, JR., M.D.

DURING 1956, the prevalence of arthropod-borne encephalitis varied considerably in the United States. Eastern equine encephalitis (EEE) returned in a small outbreak of human cases in southeastern Massachusetts, where 12 cases occurred, 8 of them fatal. Although the disease was widespread among horses and pheasants all along the Atlantic and Gulf Coasts from Massachusetts to Louisiana, only 3 other human cases were reported—2 from Maryland and 1 from Delaware. Western equine encephalitis (WEE) affected man and horses in a sporadic and sparse fashion over the western half of the country. St. Louis encephalitis (SLE) was the largest disease problem; there were several small foci in the West, with a large epidemic focus in the high plains of Texas, and an urban epidemic in Louisville, Ky., accounting for the majority of the cases.

The incidence of acute infectious encephalitis in man is reported routinely to the National Office of Vital Statistics, Public Health Service, by all States on a weekly basis. Because of the different criteria used by reporting States, this composite category embraces a crude collection of diseases of central nervous system infections including the arthropod-borne encephalitis group. The 1956 total of 2,624 cases listed according to State serves as a starting point for case appraisal (table 1). This number is the largest annual total reported for the disease category. Final totals have exceeded 2,200 cases only in 1954 and 1955. Marked annual

variation in incidence for the years 1952 and 1956 is seen in figure 1, where sharp peaks in the even years reflect the known larger epidemic occurrence of the arthropod-borne encephalitides (1). Further statistical analysis of the 1956 report data has proved of limited usefulness in appraisal of the arthropod-borne encephalitides.

In 1956, encephalitis in horses produced 1,284 clinical cases, with 493 deaths, as reported to the U. S. Department of Agriculture (2). Cases and deaths listed by State in table 2 reflect reports from widely scattered endemic foci in large geographic areas of the West, as well as highly fatal cases concentrated on the eastern seaboard. Typical of the outbreaks were those in the Columbia River Basin in Washington, western Idaho, and adjoining counties of eastern Oregon. States reporting high mortality were localized in the Atlantic and Gulf Coast sections. That EEE was the cause of the high case fatality rate (80-90 percent) was proved by laboratories reporting isolations of the virus from these areas. In sections of known WEE prevalence, appraisal of reported cases is more difficult; this disease has a much lower mortality rate (15-35 percent), and therefore fewer brain specimens are submitted for laboratory diagnosis.

Eastern Equine Encephalitis

Appraisal of the 15 human cases of EEE reported in 1956 resulted in the classification of 13 as confirmed and 2 as presumptive (table 1). The death of 10 of the patients and incapacitating sequelae in three survivors testify to the severity of this disease. A study of geographic distribution of cases shows a concentration in Massachusetts, where there were 12 cases, the

Dr. Alexander, formerly chief of the Surveillance Section, Epidemiology Branch, Communicable Disease Center, Public Health Service, is now with the department of pediatrics at the University of Chicago. Dr. Murray serves as assistant chief of the Surveillance Section of the Center.

WHO represents this use of science, and that, insofar as it is successful, WHO is building a pattern of common interest and action which can strengthen the conditions of peace.

Those of us who have had opportunity to appreciate all facets of the importance of WHO have a responsibility to meet. The holding of the World Health Assembly in the United States in 1958 gives us added opportunity to meet that responsibility.

If the Eleventh World Health Assembly appears to the American people to be merely another meeting on a technical subject, we shall have missed the boat. If it leads to greater appreciation by our public of the world demand

for health, of the effective moves to fill this demand with leadership by the World Health Organization, we will have partially grasped this priceless opportunity.

It seems to me, however, that taking full advantage of the opportunity means furthering public understanding of the role of WHO in the total world context, the context of sharp contrasts which I have tried to sketch today. The National Citizens Committee for the World Health Organization, as a voluntary association of leaders in health and public affairs, is best equipped to promote vigorously this fuller understanding of why the World Health Organization is actually important to Americans.

United States Host to Eleventh World Health Assembly

The World Health Assembly, the governing body of the World Health Organization, will hold its eleventh session in Minneapolis, Minn., beginning May 28, 1958. This will be the first session of the Assembly to be held in the United States.

Observance of the tenth anniversary of WHO is a special event of this year's meeting, and the Assembly delegates will participate in a commemorative session, May 26 and 27, preceding the regular session.

The World Health Assembly, composed of delegations from WHO's 88 member states, decides the Organization's policies, programs, and budget.

At Minneapolis, the Assembly will consider the annual report of the Director-General on the work of the World Health Organization during 1957. It will approve the program for 1959 and determine the amount of money needed to carry it out. The 1958 budget, mainly contributed by member states, is \$13,500,000.

It will also elect 6 member states, each entitled to designate a person to serve on WHO's Executive Board of 18 health specialists. Six board members retire each year. The Executive Board makes recommendations to the Assembly and gives effect to its decisions.

The Director-General is appointed by the Assembly to serve as the chief technical and administrative officer of WHO, subject to the authority of the Executive Board. Dr. M. G. Candau is the present Director-General and is in charge of a staff of about 1,400 professional workers of 54 nationalities at WHO headquarters in Geneva and in the field.

In a decade of operation, the World Health Organization, working with national health services, has made substantial progress in controlling infectious diseases, training health workers, improving sanitary conditions, and in worldwide health activities of benefit to all countries.

Classification Standards

In order to compare encephalitis activity in the different States from which varying amounts of data were submitted, standards were adopted for the classification of reported cases. These standards are flexible in recognition of the inevitable minor differences in technique between laboratories. The "confirmed" category includes all cases fulfilling the following criteria:

1. Isolation of virus.
2. Fourfold rise in titer of antibodies from acute to convalescent blood specimens.
3. A fourfold fall in titer during the convalescent stage.
4. A single high titer of complement fixing antibodies in a single convalescent serum collected from an area of proved concurrent epidemic.

The "presumptive" case includes all cases demonstrating any of the following:

1. A single high complement fixing antibody titer in an individual with clinical illness compatible with arthropod-borne encephalitis.
2. Case history of clinical encephalitis without any laboratory diagnosis in an area of proved concurrent epidemic.

The only criterion accepted as evidence of current animal infection (horses, pheasants, wild birds, mosquitoes, and other mammals) was isolation of virus.

of them confirmed (table 1). These cases, occurring in 10 States, showed a restricted, early seasonal occurrence, with a peak in mid-August. Analysis of age distribution revealed a concentration in infants (table 3). No fatalities were reported among either confirmed or presumptive cases.

Western equine encephalitis in horses was confirmed by reports of 2 isolations of the virus from brain specimens, 1 in Oklahoma and 1 in Washington. In the California encephalitis surveillance reports diagnoses were confirmed in fourfold, or greater, rises in antibody titer in clinical cases in horses (12). Including serologic and histopathological diagnoses, the U. S. Department of Agriculture lists another 33 instances of confirmation of diagnoses in 10 States (2). It was possible to accept as confirmed cases only those with virus isolation be-

cause of the difficulty encountered in the interpretation of serologic results of single blood specimens submitted without knowledge of the immunity status. The extensive use of vaccines, the difficulty in obtaining adequate history of their use, and the relatively sparse horse populations discourage reliance on reported clinical cases of WEE in horses. Characteristic case fatality of 25 to 35 percent was recorded in the clinical reports of the 1956 epidemics in the Columbia River Basin.

Eight species of wild birds yielded WEE virus in Rhode Island, New Jersey, and Louisiana, as reported by research groups who are working primarily on the ecology of EEE (4-6, 8). For Rhode Island, the isolation of WEE from a chukar partridge is the first demonstration of this virus in the State, but in the other two States there were previous isolations.

The encephalitis surveillance program of the California State Department of Health reported isolations in 1956 of WEE from brains of four grey squirrels.

During 1956, WEE virus was isolated from 307 pools of mosquitoes collected in New Jersey, North Dakota, Texas, Nevada, Colorado, Idaho, Washington, and California, with the most isolations from the last four States. All isolations were from pools of *Culex tarsalis* except 2 in Texas which were from *Culex quinquefasciatus*, and 1 from *C. melanura* in an engorged pool in New Jersey.

Some measure of comparison with previous years is available from reports of the California State Department of Health. Mosquitoes collected in similar fashion from year to year in four county study areas reveal the following:

| | 1954 | 1955 | 1956 |
|---------------------|------|--------|--------|
| Pools tested..... | 989 | 1, 113 | 1, 047 |
| Pools positive..... | 238 | 82 | 145 |
| WEE virus..... | 151 | 68 | 143 |
| SLE virus..... | 87 | 14 | 2 |

In terms of WEE virus recovery from mosquitoes, 1956 was not a light year, yet few human cases occurred.

St. Louis Encephalitis

The occurrence of 562 cases of SLE, 227 confirmed, makes this disease paramount among

majority occurring in the southeastern part of the State in an area characterized by numerous fresh-water swamps. In 1938 the same area had 34 human cases of EEE, 25 of them fatal (3). The 1938 and 1956 outbreaks represent the largest and second largest, respectively, both for the State and for the Nation. One of the 1956 cases occurred in Delaware, and 2 in Maryland.

Seven laboratories within 10 Gulf and Atlantic Coast States reported a total of 42 isolations of EEE virus from horse brain specimens, the majority from New Jersey and Massachusetts (table 2). A wide range of seasonal occurrence is represented by isolations from Louisiana in May, and from New Jersey in early November. Although no virus isolations were reported from horses in Alabama and Florida, strong presumptive evidence of EEE is reflected in the reported mortality in excess of 90 percent (table 2).

Followup studies in 1956 on outbreaks of EEE in domestic pheasants resulted in 42 virus isolations from brain specimens submitted from Massachusetts, Rhode Island, Connecticut, and New Jersey.

EEE virus was isolated from 20 serum specimens collected from wild birds during ecologic studies in four States—Massachusetts, Rhode Island, New Jersey, and Louisiana (4-8). A few of the 20 virus isolations were from immature birds, and about equal numbers were from permanent-resident and migrant birds.

Natural isolations of EEE virus were obtained from 11 pools of arthropods collected in three States. From Massachusetts, five pools of unengorged *Culiseta melanura* were positive (7). Two pools of unengorged and one of engorged *C. melanura* collected in New Jersey, and two of engorged *Culex salinarius* collected in that State, yielded virus when tested in the Communicable Disease Center laboratory (9, 10).

These isolations incriminate *C. melanura* as the most probable vector of EEE, since it is the only species thus far to yield multiple isolations of virus from unengorged mosquitoes. This species was in high prevalence in both the Massachusetts and the New Jersey areas. Studies have indicated that their blood meals were primarily from birds and rarely, if ever,

Data Collection

For the past decade, the Communicable Disease Center of the Public Health Service has conducted intensive field studies on the arthropod-borne encephalitides. Beginning in 1955, a systematic effort was made to collect data on the occurrence of these infections throughout the country. Sources included reports from the National Office of Vital Statistics of the Public Health Service, State and local health departments, academic and many other medical and veterinary virus diagnostic laboratories, the Disease Eradication Branch of the Department of Agriculture, and the Walter Reed Army Institute of Research. A report summarizing all the material was then distributed to contributors and others concerned with the control of these diseases.

This nationwide surveillance and continued mutual exchange of data resulted, in 1956, in five concurrent seasonal reports and an annual summary report, which are available on request to those interested in encephalitis research. By defining the pattern of arthropod-borne encephalitis in 1956, it is hoped that the public health importance of these diseases will be further clarified.

The present paper summarizes the information on the occurrence of arthropod-borne infections in 1956 and includes a summary of data for past years.

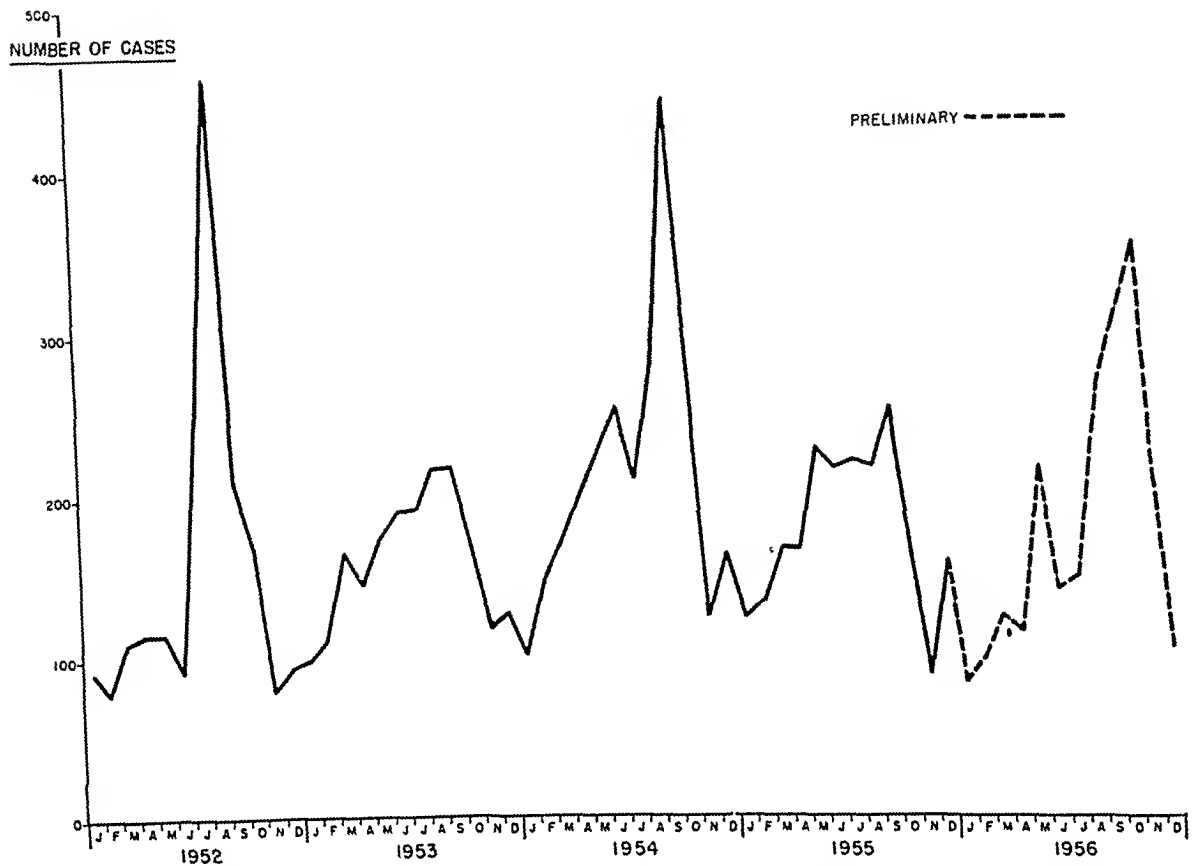
from man or horses. Therefore, this species may be the prime vector between birds and the occasional vector to humans or horses. It may be, however, that another species less often infected transfers the disease to these mammalian hosts.

Isolations of EEE virus were made from arthropods collected in Georgia, in July 1956 (11). For the first time, the virus was isolated from *Aedes mitchellae* and a pool of mixed species of insects from the genus *Culicoides*, and, for the second time, from *Anopheles crucians*. The separation of engorged specimens from the processed pools was not reported.

Western Equine Encephalitis

The sporadic and endemic occurrence of WEE in the western half of the United States during 1956 resulted in reports of 47 cases, 37

Figure 1. Reported infectious encephalitis cases in the United States, 1952-56.



the arthropod-borne encephalitides in 1956 (table 1). Two large epidemics accounted for the majority of these cases. In the high plains area of the Texas Panhandle, a rural epidemic included over 250 cases of clinical encephalitis. Of these, 89 were confirmed in the laboratory as SLE and 15 as WEE, while the remainder were classified as presumptive. During an urban epidemic in Louisville, Ky., 110 people were affected. Other small epidemic foci were in Colorado, Kansas, Indiana, and southern Kentucky (at the Tennessee border), and sporadic cases were reported from 11 other States. Seven of 31 deaths were confirmed, 2 by virus isolation from brain tissue (table 1). Following the epidemic in Louisville, a 6 percent prevalence of complement fixing antibodies was found in serums from over 700 persons. From this, a crude estimate shows that the ratio of inapparent to apparent infections was more than 200 to 1.

There were 26 isolations of SLE virus from

pools of mosquitoes reported in 1956, still sparse in comparison with reported isolations of WEE. All were made from pools of *C. tarsalis* collected from widely distributed foci in North Dakota, Kansas, Idaho, Colorado, Utah, Washington, and California. Considerable numbers of mosquitoes were collected in Texas and in the Louisville area but no SLE virus was obtained. No SLE virus isolations were reported from wild birds or other animals during that year.

Discussion

A composite of the total virus activity in 1956 for each of the three arthropod-borne encephalitides, as shown in figure 2, represents the sum of all evidence for activity of each specified virus in certain mammals, wild or domestic birds, and mosquitoes.

In some States the only evidence of EEE virus activity in an area was the excess mortality

Table 1. Encephalitis by State during 1956

| State | Report data ¹ | Cases appraised as arthropod-borne encephalitis | | | | | | Fatal cases |
|---------------------------|--------------------------|---|--------------|------------|--------------|------------|--------------|-------------|
| | | EEE | | WEE | | SLE | | |
| | | Con-firmed | Presump-tive | Con-firmed | Presump-tive | Con-firmed | Presump-tive | |
| Maine..... | 5 | | | | | | | |
| New Hampshire..... | 1 | | | | | | | |
| Massachusetts..... | 35 | 11 | 1 | | | | | 1 |
| Rhode Island..... | 5 | | | | | | | |
| Connecticut..... | 10 | | | | | | | |
| New York..... | 386 | | | | | | | |
| New Jersey..... | 34 | | | | | | | |
| Pennsylvania..... | 1 | | | | | | | |
| Ohio..... | 125 | | | | | | | |
| Indiana..... | 74 | | | | | 20 | 4 | |
| Illinois..... | 146 | | | | | | | |
| Michigan..... | 85 | | | | | | | |
| Wisconsin..... | 13 | | | | | | | |
| Minnesota..... | 8 | | | 2 | | 2 | | |
| Iowa..... | 24 | | | | | | | |
| Missouri..... | 15 | | | | | | 2 | |
| North Dakota..... | 16 | | | | | | | |
| South Dakota..... | 14 | | | 1 | | 2 | | |
| Nebraska..... | 19 | | | | | | | |
| Kansas..... | 136 | | | | 5 | 12 | 42 | 13 |
| Delaware..... | | 1 | | | | | | |
| Maryland..... | 27 | 1 | 1 | | | | | 2 |
| District of Columbia..... | 10 | | | | | | | |
| Virginia..... | 27 | | | | | | | |
| West Virginia..... | 4 | | | | | | | |
| North Carolina..... | 34 | | | | | | | |
| South Carolina..... | 21 | | | | | | | |
| Georgia..... | 17 | | | | | | | |
| Florida..... | 15 | | | | | | | |
| Kentucky..... | 145 | | | | | 64 | 56 | 11 |
| Tennessee..... | 27 | | | | | 1 | 3 | 1 |
| Alabama..... | 27 | | | | | | | |
| Mississippi..... | 19 | | | | | | | |
| Arkansas..... | 19 | | | | | | | |
| Louisiana..... | 4 | | | | | | | |
| Oklahoma..... | 16 | | | | | | | |
| Texas..... | 346 | | | 15 | 2 | 89 | 193 | 19 |
| Montana..... | 4 | | | | | | | |
| Idaho..... | 7 | | | 2 | 1 | 1 | 1 | |
| Wyoming..... | 3 | | | 2 | | | | |
| Colorado..... | 66 | | | | 1 | 24 | 33 | 13 |
| New Mexico..... | 7 | | | | 1 | | | |
| Arizona..... | 7 | | | | | 1 | | |
| Utah..... | 6 | | | | | | 1 | |
| Nevada..... | 2 | | | | | | | |
| Washington..... | 29 | | | 1 | | 3 | | 1 |
| Oregon..... | 24 | | | | | 1 | | |
| California..... | 559 | | | 14 | | 7 | | |
| Total..... | 2,624 | 13 | 2 | 37 | 10 | 227 | 335 | 11 |

¹ Reported Incidence of Notifiable Diseases in the United States, 1956, Morbidity and Mortality Weekly Report, Annual Supplement, vol. 5, No. 53, National Office of Vital Statistics, Public Health Service. No reported or appraised cases from Vermont.

² Eastern equine encephalitis.

³ St. Louis encephalitis.

Table 3. Age distribution of encephalitis cases under age 10

| Age group (years) | Eastern equine encephalitis | | | Western equine encephalitis | | | St. Louis encephalitis | | | | | | | | |
|----------------------|--------------------------------|---|-------|--------------------------------|---|-------|------------------------|---|-------|--------------|---|-------|--------------|----|-------|
| | | | | | | | Mountain and Pacific | | | East Central | | | West Central | | |
| | C | P | Total | C | P | Total | C | P | Total | C | P | Total | C | P | Total |
| 0-1 | 2 | | 2 | 9 | | 9 | | 1 | 1 | | | | 1 | 19 | 20 |
| 1-2 | 1 | | 1 | 2 | | 2 | | | | | | | | 4 | 4 |
| 2-3 | 1 | | 1 | | | | | | | 2 | | 2 | 1 | 6 | 7 |
| 3-4 | 1 | | 1 | | | | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 11 | 12 |
| 4-5 | 1 | 1 | 2 | 2 | | 2 | 1 | | 1 | 1 | | 1 | 1 | 6 | 7 |
| 5-6 | | | | 1 | | 1 | 3 | 3 | 6 | 2 | | 2 | | 3 | 3 |
| 6-7 | 1 | | 1 | 3 | 1 | 4 | | | | | | | | 6 | 6 |
| 7-8 | 1 | | 1 | | | | 1 | | 1 | 1 | | 1 | | 4 | 4 |
| 8-9 | 1 | | 1 | 2 | | 2 | 1 | | 1 | | | | 2 | 3 | 5 |
| 9-10 | 1 | | 1 | 1 | | 1 | 3 | | 3 | | | | 1 | 1 | 2 |
| Total | 10 | 1 | 11 | 20 | 1 | 21 | 10 | 5 | 15 | 4 | 3 | 7 | 7 | 63 | 70 |

C=confirmed; P=presumptive.

reducing the reservoir of the virus in nature, is effective in preventing transmission to man. Another point of view holds that the incidence in humans is not directly related to the virus infection rate in mosquitoes, that it has direct relation to the immunity status of the exposed population. Further evidence will be needed to clarify this point.

Although sizable widespread outbreaks of SLE were recorded in 3 States and sporadic cases in 11 others, activity of this virus was not described outside previously known areas (fig. 3). For an analysis of SLE characteristics in different areas, cases were arranged into the following geographic divisions: East Central States (Indiana, Kentucky, and Tennessee), West Central States (Minnesota, Missouri, South Dakota, Kansas, and Texas), and Mountain and Pacific States (Idaho, Colorado, Utah, Nevada, Washington, Oregon, and California).

A study of the sex distribution of cases in these areas reveals markedly equal incidence in males and females in West Central and Mountain-Pacific States (males, 221; females, 220), but a notable predominance of cases in females in the East Central States (males, 49; females, 99). This is a reflection of the data from Louisville, but this same predominance among females was not found in a recent serologic survey.

Marked contrasts occur in age distribution of cases of SLE in these areas (fig. 4). In the

East Central States there is a paucity of cases among children and young people, with peak incidence in the 40- to 70-year age groups. This pattern is typical for 1933 and for the past 2 years. In this area the epidemiological characteristic most likely to suggest SLE is the initial report of seasonal encephalitis in older persons. In sharp contrast, epidemiologists in western States report a typical preponderance of SLE cases in the under-10-year age group, but with a weighting toward the upper level of this age bracket. It also contrasts sharply with the age pattern for WEE and EEE, both of which most frequently affect infants (table 3).

The West Central States have a larger proportion of presumptive SLE cases, as reported from extensive occurrences in Texas and Kansas (fig. 4). In the light of WEE virus activity in these areas, some cases classified as presumptive on clinical grounds in these major SLE epidemic areas actually may have been WEE. This might account for some of the cases in the under-10 age group, and particularly those in infants (table 3). To ascertain the true distribution of SLE, incidence figures should include only confirmed cases. To determine whether the age distribution pattern for SLE in the West Central States adheres to the pattern in the Mountain and Pacific States or to that in the East Central States, or a mixture of the two, requires more exact data.

The seasonal occurrence in these three geo-

in horses, but this evidence, although presumptive in nature, has proved remarkably reliable in the past. In addition, the report data on horses more clearly reflect seasonal occurrence than do data on human cases.

In 1956, the farthest extension southward of human cases of EEE was in Maryland, and the southernmost outbreaks in pheasants occurred in New Jersey. In contrast, during 1955, human cases of EEE were reported from Texas and Louisiana, and pheasant outbreaks from North Carolina and Florida. The seasonal occurrence of human cases was restricted to August and September in 1956; during 1955, onsets in an identical number of reported cases ranged from April to December. The 1956 epidemic in Massachusetts reached a peak during the first week of September, while the four cases reported from Massachusetts in 1955 had onset dates in late September and early October. This may have resulted from a late seasonal increase in mosquito prevalence attributed to the mid-September hurricane Diane. The epidemic peak in 1938 was reached shortly before a mid-September hurricane. Also in contrast with previous years, increased interest and improved laboratory techniques in 1956 have generated an impressive number of EEE virus isolations from wild birds and mosquitoes.

The distribution of WEE virus in 1956 followed expected patterns except for an extension into Rhode Island, as represented by a single isolation from a chukar partridge (fig. 3). For the second year this virus was active in New Jersey, where an impressive number of isolations were made from wild birds and from one pool of mosquitoes (4-6,9,10). These isolations demonstrate the extension of WEE virus activity to eastern shores and give fair warning signals for careful surveillance in these areas for both human and equine cases of this disease.

Again in 1956, as in recent years, an even more restricted interepidemic reporting of human and horse cases occurred, but substantial virus recovery from mosquitoes in several areas indicated that natural reservoirs were maintained and became widely dispersed.

Throughout much of the West, an abundance of the most efficient WEE vector, *C. tarsalis*, and the indications of highly susceptible human populations makes the disease a threat of con-

siderable magnitude. This is especially true in rapidly developing irrigated areas, which may result in the introduction of a greater number of susceptible humans, more wild birds, and new breeding sites for *C. tarsalis*.

The irrigated areas of California contained a considerable number of pools of *C. tarsalis* with WEE virus in 1956. The fact that there were few human cases has been attributed by some to the effectiveness of the mosquito control program in the State, which, although not

Table 2. Reported encephalitis in horses, by State, in 1956

| State | Reported cases ¹ | Total deaths ¹ | Number confirmed by virus isolation |
|----------------|-----------------------------|---------------------------|-------------------------------------|
| Massachusetts | 46 | 46 | 28 |
| Rhode Island | 9 | 9 | 2 |
| Connecticut | 1 | 1 | 1 |
| New Jersey | 48 | 46 | 11 |
| Indiana | 10 | 2 | |
| Illinois | 7 | | |
| Michigan | 19 | 1 | |
| Minnesota | 14 | | |
| Iowa | 15 | 10 | |
| Missouri | 28 | | |
| North Dakota | 8 | | |
| South Dakota | 50 | 4 | |
| Nebraska | 20 | 4 | |
| Kansas | 24 | 4 | |
| Delaware | 25 | 17 | 3 |
| Maryland | 33 | 33 | 3 |
| Virginia | 28 | | |
| North Carolina | 34 | 19 | 1 |
| South Carolina | 27 | 25 | 3 |
| Georgia | 44 | 32 | 8 |
| Florida | 107 | 87 | |
| Tennessee | 11 | 11 | |
| Alabama | 33 | 32 | |
| Mississippi | 9 | 9 | |
| Louisiana | 37 | 35 | 2 |
| Oklahoma | 36 | 14 | 1 |
| Texas | 133 | | |
| Montana | 35 | | |
| Idaho | 103 | 11 | |
| Wyoming | 29 | 9 | |
| Colorado | 25 | 5 | |
| New Mexico | 5 | | |
| Arizona | 16 | | |
| Utah | 16 | 2 | |
| Nevada | 8 | 2 | |
| Washington | 69 | 21 | 1 |
| Oregon | 65 | 1 | |
| California | 57 | 1 | |
| Total | 1,284 | 493 | 42 |
| | | | 2 |

¹ Data from Animal Disease Eradication Division, U. S. Department of Agriculture.

² Eastern equine encephalitis.

³ Western equine encephalitis.

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| Age group (years) | Eastern equine encephalitis | | | Western equine encephalitis | | | St. Louis encephalitis | | | | | | | | |
|----------------------|--------------------------------|---|-------|--------------------------------|---|-------|------------------------|---|-------|--------------|---|-------|--------------|----|-------|
| | | | | | | | Mountain and Pacific | | | East Central | | | West Central | | |
| | C | P | Total | C | P | Total | C | P | Total | C | P | Total | C | P | Total |
| 0-1 | 2 | | 2 | 9 | | 9 | | 1 | 1 | | | | 1 | 19 | 20 |
| 1-2 | 1 | | 1 | 2 | | 2 | | | | | | | | 4 | 4 |
| 2-3 | 1 | | 1 | | | | | | | 2 | | 2 | 1 | 6 | 7 |
| 3-4 | 1 | | 1 | | | | 1 | 1 | 2 | 1 | | 1 | 1 | 11 | 12 |
| 4-5 | 1 | 1 | 2 | 2 | | 2 | 1 | | 1 | 1 | | 1 | 1 | 6 | 7 |
| 5-6 | | | | 1 | | 1 | 3 | 3 | 6 | 2 | | 2 | | 3 | 3 |
| 6-7 | 1 | | 1 | 3 | 1 | 4 | | | | | | | | 6 | 6 |
| 7-8 | 1 | | 1 | | | | 1 | | 1 | 1 | | 1 | | 4 | 4 |
| 8-9 | 1 | | 1 | 2 | | 2 | 1 | | 1 | | | | 2 | 3 | 5 |
| 9-10 | 1 | | 1 | 1 | | 1 | 3 | | 3 | | | | 1 | 1 | 2 |
| Total | 10 | 1 | 11 | 20 | 1 | 21 | 10 | 5 | 15 | 4 | 3 | 7 | 7 | 63 | 70 |

C=confirmed; P=presumptive.

reducing the reservoir of the virus in nature, is effective in preventing transmission to man. Another point of view holds that the incidence in humans is not directly related to the virus infection rate in mosquitoes, that it has direct relation to the immunity status of the exposed population. Further evidence will be needed to clarify this point.

Although sizable widespread outbreaks of SLE were recorded in 3 States and sporadic cases in 11 others, activity of this virus was not described outside previously known areas (fig. 3). For an analysis of SLE characteristics in different areas, cases were arranged into the following geographic divisions: East Central States (Indiana, Kentucky, and Tennessee), West Central States (Minnesota, Missouri, South Dakota, Kansas, and Texas), and Mountain and Pacific States (Idaho, Colorado, Utah, Nevada, Washington, Oregon, and California).

A study of the sex distribution of cases in these areas reveals markedly equal incidence in males and females in West Central and Mountain-Pacific States (males, 221; females, 220), but a notable predominance of cases in females in the East Central States (males, 49; females, 99). This is a reflection of the data from Louisville, but this same predominance among females was not found in a recent serologic survey.

Marked contrasts occur in age distribution of cases of SLE in these areas (fig. 4). In the

East Central States there is a paucity of cases among children and young people, with peak incidence in the 40- to 70-year age groups. This pattern is typical for 1933 and for the past 2 years. In this area the epidemiological characteristic most likely to suggest SLE is the initial report of seasonal encephalitis in older persons. In sharp contrast, epidemiologists in western States report a typical preponderance of SLE cases in the under-10-year age group, but with a weighting toward the upper level of this age bracket. It also contrasts sharply with the age pattern for WEE and EEE, both of which most frequently affect infants (table 3).

The West Central States have a larger proportion of presumptive SLE cases, as reported from extensive occurrences in Texas and Kansas (fig. 4). In the light of WEE virus activity in these areas, some cases classified as presumptive on clinical grounds in these major SLE epidemic areas actually may have been WEE. This might account for some of the cases in the under-10 age group, and particularly those in infants (table 3). To ascertain the true distribution of SLE, incidence figures should include only confirmed cases. To determine whether the age distribution pattern for SLE in the West Central States adheres to the pattern in the Mountain and Pacific States or to that in the East Central States, or a mixture of the two, requires more exact data.

The seasonal occurrence in these three geo-

Figure 2. Geographic distribution of arthropod-borne encephalitides in man and animals in the United States, 1956.

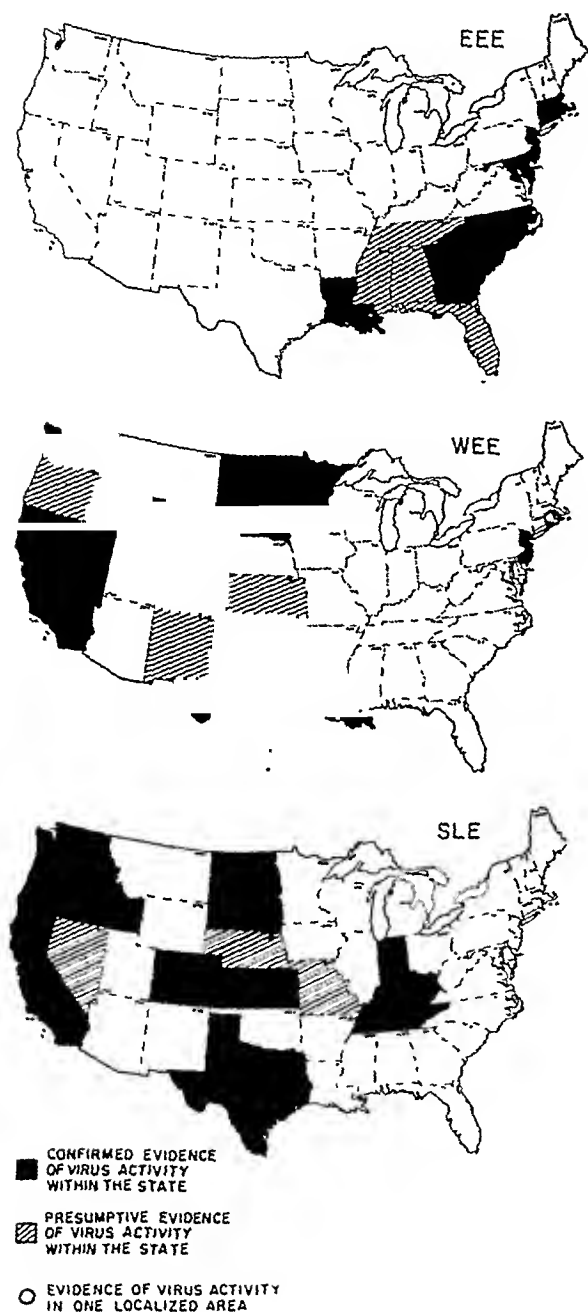
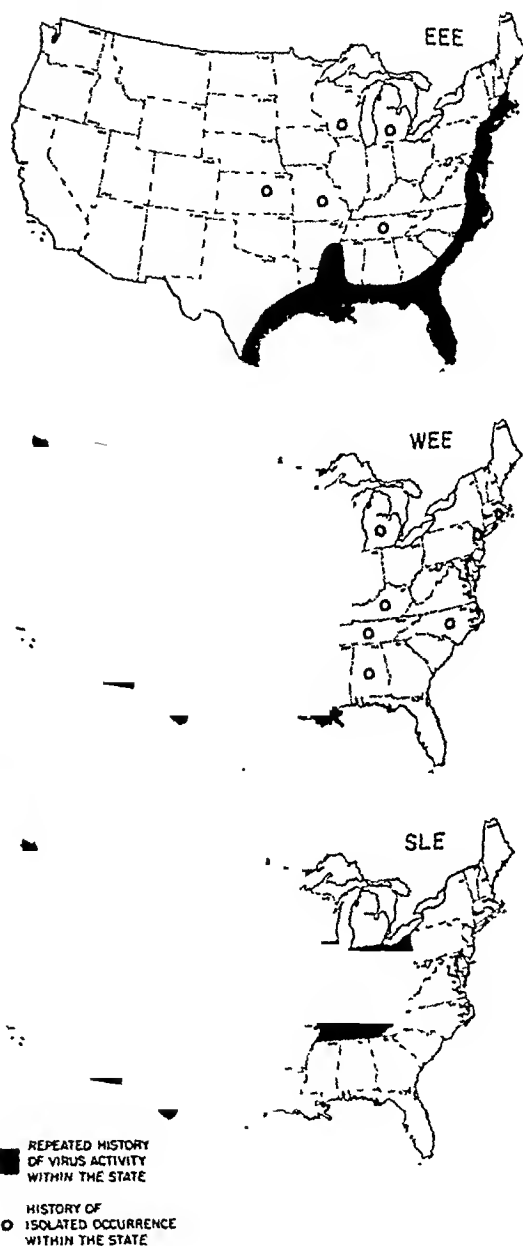


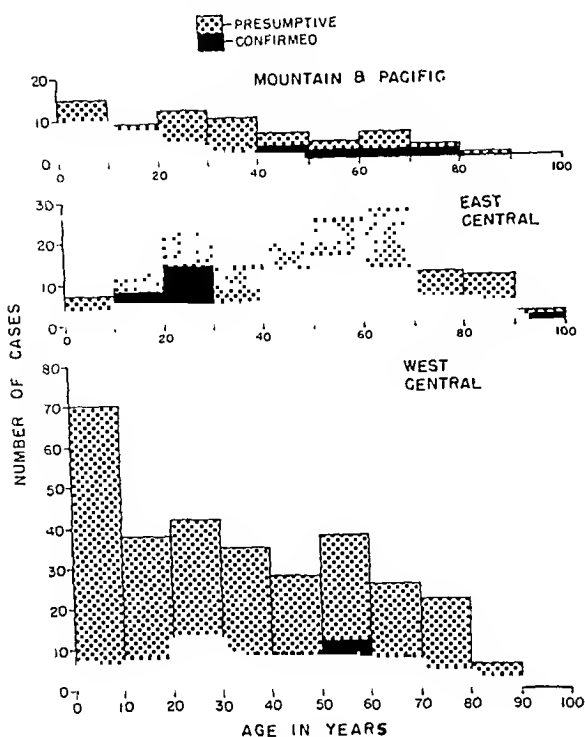
Figure 3. Historical pattern of arthropod-borne encephalitis virus activity, by State, through 1956.



graphic areas reveals a situation similar to that in the age distribution study (fig. 5). Peak occurrence was in August in the Mountain-Pacific States following the August peak of WEE. Also consistent with previous reports was the September peak for SLE in East Cen-

tral States, with abrupt cessation of activity even before killing frosts. In confirmed cases from West Central States, SLE activity is faithfully reflected in the late August peak, but the addition of presumptive cases shifts the curve to a later period. As with the age distribution data, this again is a dilution of the analysis with presumptive cases, which in-

Figure 4. Age distribution of St. Louis encephalitis in 1956, by region.

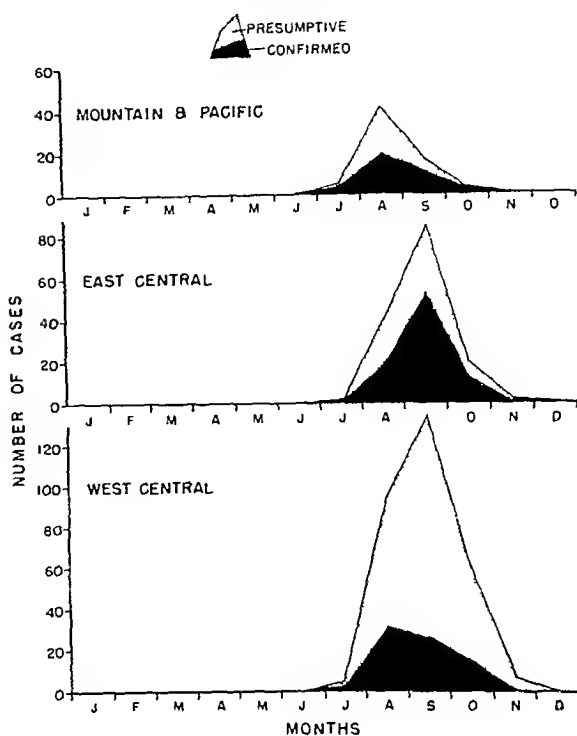


cluded many with date of report rather than date of onset.

A problem concerned with arthropod-borne encephalitis illnesses is the severity of sequelae after apparent and, possibly, inapparent infections. In certain States, information on sequelae is being obtained as a part of research studies. A longitudinal clinical followup study in California has reported that permanent sequelae are mainly confined to those persons who were in the under-10 group at the time of infection, and that the frequency of severe sequelae appears to be greatest in infants, particularly in infants under 3 months of age (13).

It is interesting to speculate on the possible explanations of the differing epidemiological characteristics in these two areas. Two contributing factors may be operative. First, SLE in Mountain and Pacific States probably is transmitted primarily by *G. tarsalis*, whereas in Eastern Central States the vector is probably *Culex pipiens* or *C. quinquefasciatus*. The characteristics of these species regarding field or house environment may be important, and

Figure 5. Monthly case occurrence of St. Louis encephalitis in 1956, by region.



it is possible that the continued passage of the same virus through species with different incubation periods may lead to minor strain variations. Some laboratory investigations would suggest that such strain differences can be seen in virus isolated in those two geographic areas, although there is no antigenic differentiation.

The second factor to consider is the accumulating knowledge on the immunity of resident populations in the two areas. In certain endemic locations in the West there are significantly higher neutralizing antibody rates to SLE, with little history of clinical disease, than in comparable populations in the East Central States. Although the explanation for the differences in age distribution is not clear, and it is probably more complex than it appears, the fact that there is a significant difference between the two areas is important to record and study.

Studies of the hidden public health problems which may be presented by these diseases are in progress. Increased emphasis on diagnosis of aseptic meningitis may help elucidate cases that are often reported as viral encephalitis.

In many laboratories, work is advancing on the problems of the unidentified viruses, of isolated viruses whose potential for causing disease is unknown, and of disease agents that react with serums of patients from past epidemics of "unidentified encephalitis." Likewise, the problem of encephalitis of unknown etiology might be attacked by better analyses of the diseases reported as encephalitis, particularly the parainfectious encephalitides.

A real problem today resides in arthropod-borne encephalitides that are not now seen in the United States but might be imported. For example, in 1956 an illness in an individual, who became sick on arrival in California from Okinawa, was later diagnosed as Japanese B encephalitis, and in 1955 a case of Venezuelan encephalitis was reported in a laboratory worker in Washington, D. C. The public health hazard in such instances is the possibility of mosquitoes becoming infected, permitting survival and propagation of the virus locally. This, plus the possible introduction of infected mosquitoes, points up the need for increased knowledge and surveillance of arthropod-borne viruses by those responsible for the public health.

Summary

By charting the pattern of arthropod-borne encephalitis during 1956 through surveillance activities, it is hoped the public health importance of these diseases will be further defined.

The increased incidence of the arthropod-borne encephalitides in 1956 was characterized by:

The sporadic occurrence of EEE in horses throughout the Atlantic and Gulf States, with restriction in humans to 12 cases in southeastern Massachusetts, 1 in Delaware, and 2 in Maryland. Substantial virus isolations were recorded from mosquitoes and wild birds in Massachusetts and New Jersey.

Western equine encephalitis occurred diffusely in nature, as reflected by recovery of virus from mosquitoes. Although it failed to spill over into man and horses in epidemic fashion, it still remained a severe disease threat in irrigated areas of the West.

St. Louis encephalitis was the main contributor to the high incidence of reported acute infectious encephalitis. Although the virus was difficult to recover from participants in the natural cycle, the disease was readily apparent in a large rural epidemic in Texas and in three smaller foci in Kansas, Colorado, and Indiana. SLE reappeared in an urban epidemic in Louisville, Ky., for the first time since 1937.

Numerous public health problems, those stemming from encephalitis of unknown etiology, for example, and the possible importation of foreign encephalitides require further study.

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WHO Tenth Anniversary Publications

On the occasion of the tenth anniversary of the World Health Organization, the agency has prepared a variety of information materials, described briefly in the following list. Unless otherwise indicated, all items are available at the Office of Public Information, Pan American Sanitary Bureau, Regional Office for the Americas, 1501 New Hampshire Ave., NW., Washington, D. C.

- A series of basic fact sheets on WHO structure and programs, issued in quantity about every 2 weeks.

- A folder entitled "WHO, What it is, What it does." The last page presents in tabloid form, "Ten Years of World Health."

- An illustrated brochure, "Ten Steps Forward." It contains 40 pages of text written by a well-known English science writer and 24 pages of photographs. The publication is sold for 50 cents through the Columbia University Press, International Document Service, 2960 Broadway, New York 27, N. Y. Glossy prints may be obtained from the Pan American Sanitary Bureau.

- A 500-page book in commemoration of the tenth anniversary, covering all phases of WHO. At the end of May 1958 the book will also be available at the Columbia University Press.

- A book on WHO and the public health problem in the Americas and Western Africa. Written by Murray Morgan, a reporter from the State of Washington, it is published by Viking Press under the title "Doctors to the World." Available in May 1958 at regular bookstores.

- *World Health* magazine, formerly the WHO newsletter, special anniversary edition including 80,000 copies in English. The publication will be distributed in May and June 1958.

- A tenth anniversary film, in black and white, running for about 55 minutes, and especially tailored for television showing.

- A tenth anniversary set of 12 photographs entitled "World Health Advances." Each is supplied with an explanatory caption and packed in a large envelope.

- "Pictures of Health," a small booklet using the photographs which appear in the picture set. It is designed for use as a throwaway complementary to the WHO folder.

St. Louis Encephalitis in 1933

observations on epidemiological features

By L. L. LUMSDEN, M.D.



L. L. Lumsden, 1875-1946, a self-styled "shoe-leather" epidemiologist, was a pioneer in indicting the mosquito as a vector of encephalitis. A Public Health Service officer from 1898 to 1939, Lumsden blended rugged realism with an imagination that conceived of the Public Health Service as a logical nucleus for national coordination of State, county, and municipal health activities. He also organized at Yakima, Wash., a full-time county health service, setting a national pattern for local health departments.

THESE OBSERVATIONS on the epidemiology of epidemic encephalitis lethargica are based on findings in the course of studies authorized in a letter dated September 14, 1933, from the Surgeon General of the Public Health Service. The studies included field surveys in St. Louis City, St. Louis County, Independence, Jackson County, Kansas City, Sedalia, Jefferson City, and Columbia in Missouri. East St. Louis, Collinsville, and Chicago in Illinois, and Louisville and Jefferson County in Kentucky.

Intensive studies, including home visits and collection of individual epidemiological case histories, were made in Independence and in Blue Township in Jackson County. In the collection of detailed data in that city and township able assistance was furnished by Dr. W. F. Lunsford, statistician, Missouri State Board of Health, and by the staff of the Jackson County Health Unit. In the other places visited the studies made by the writer were of a general rather than an intensive detailed character. In

the St. Louis region, where next after the Independence region the incidence of the disease in proportion to population was highest and where the large majority of the cases in the epidemic occurred, the intensive detailed studies were made by other officers of the Public Health Service, and their findings, presumably, will be the subject of an exhaustive detailed report.

Chronology and Geographic Distribution

From such evidence as has been obtainable, it appears that the earliest cases of encephalitis lethargica definitely diagnosed in the Missouri epidemic of 1933 had their onset of pronounced symptoms in the last day or two of July and were in a few persons residing in widely separated homes in rural parts of St. Louis County, 10 to 15 miles out from the limits of St. Louis City. Soon thereafter, the disease developed in epidemic rate among the residents of the thickly built-up zone ranging from 1 to 5 miles

In 1933 an unprecedented outbreak of human encephalitis occurred near St. Louis, Mo. When investigations were started by local, State, Federal, and other research workers, it was not known whether a virus, bacterium, or toxic chemical agent was involved. The mode of transmission was equally obscure. During the course of the epidemic, a virus was isolated and characterized—the first time that the etiological agent of any acute epidemic encephalitis of man had been identified. The virus of western equine encephalitis had been under study in the laboratory only since 1930; the virus of eastern equine encephalitis was being studied concurrently with the St. Louis virus and its isolation was also reported in 1933. These were known only as equine diseases. The role of mosquitoes in spreading any of these viruses was not known.

Into this abyss of ignorance and into the midst of a raging epidemic, the Surgeon General of the Public Health Service assigned Medical Director L. L. Lumsden for epidemiological studies. Two conflicting views developed as to the mode of spread of the St. Louis agent. A majority group, influenced by previous epidemiological studies on poliomyelitis and lethargic encephalitis, favored human to human

transmission, while a minority viewpoint, vigorously presented by Lumsden, favored insect transmission.

It is to Lumsden's credit that, after a careful survey of the situation, he reached a sound hypothesis as to the mode of transmission of St. Louis encephalitis, a hypothesis which has proved applicable to other virus encephalitides in North America. This has been abundantly proved by later work. For this reason, Lumsden's unpublished report of 1933, with its sound conclusions as well as its deficiencies, is printed in full at this time.

The ease and frequency with which the viruses of St. Louis, western equine, and eastern equine encephalitis are now isolated from nature and manipulated in the laboratory indicate progress in this field which must be credited largely to a small group of devoted workers who have continued inquiries when there were no epidemics and when there was little interest or support for such research. However, if we were today confronted with another episode of encephalitis lethargica such as the 1933 St. Louis epidemic, it is debatable if its course could be materially altered, the mortality rates suppressed, or the sequelae ameliorated.

—WILLIAM L. JELLISON, *parasitologist, Rocky Mountain Laboratory, Public Health Service, Hamilton, Mont.*

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Senior Surgeon J. P. Leake states, "during the early part of the epidemic, the rate of incidence in St. Louis County was 11 times that in St. Louis City." Eventually cases of the disease were reported from every ward of the city, but for the whole period of the epidemic (approximately August 5 to October 14) the rate of incidence was very much higher among residents of the outlying western wards next to the county line than among residents of the "downtown" wards, although the latter include some of the most densely populated areas of the city. According to reports as of October

10, the rate of incidence in the two large wards adjacent to the Mississippi River and farthest downtown from the heavily affected county zone was only about one-fifth of that in some of the outlying wards adjacent to the county zone. For the whole period of the epidemic, the rate of incidence, according to official reports, in St. Louis County was nearly four times that in St. Louis City.

If the rates of incidence of encephalitis in the different areas of St. Louis City were, as appears probable, even roughly or generally in inverse proportion to the distance from the St. Louis County zone of high prevalence, such occurrence taken alone would appear to be of some epidemiological significance, and, perhaps, would become of more epidemiological significance if considered in connection with

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the direction of prevailing winds, with main currents of travel by persons, and with other possible factors in the spread of disease.

According to records of the State board of health, the reports of cases of encephalitis lethargica, by weeks, in the cities and counties of Missouri in the period August 1 to October 21, 1933, were as indicated in table 1 (1).

From these records it appears that the epidemic began and also reached its height in the St. Louis region about a week or two before it did in the Independence (Jackson County) region, but that the marked decline in the epidemic occurred somewhat sooner in the Independence region than it did in the St. Louis region. It is interesting to note that of the two

Table 1. Number of cases of encephalitis reported, by weeks, and case incidence, 1933

| Location | Week ended— | | | | | | | | | | | Total cases | Popula- tion ¹ | Case rate, 100,000 population | | |
|---------------------------------|-------------|----|-----|-----------|-----|-----|-----|----|---------|----|----|-------------|------------------------------|-------------------------------------|--|--|
| | August | | | September | | | | | October | | | | | | | |
| | 12 | 19 | 26 | 2 | 9 | 16 | 23 | 30 | 7 | 14 | 21 | | | | | |
| <i>City</i> | | | | | | | | | | | | | | | | |
| St. Louis..... | 3 | 15 | 40 | 104 | 107 | 104 | 62 | 45 | 41 | 14 | 13 | 548 | 821,960 | 66 | | |
| Independence ² | | | | | | | | | | | | (63) | 15,296 | 421 | | |
| Kansas City..... | 0 | 1 | 2 | 5 | 4 | 0 | 0 | 0 | 0 | 0 | 4 | 16 | 399,746 | 4 | | |
| St. Joseph..... | 0 | 0 | 4 | 10 | 8 | 9 | 2 | 3 | 5 | 3 | 0 | 44 | 80,935 | 54 | | |
| Jefferson City..... | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 21,596 | 0 | | |
| Sedalia..... | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20,806 | 0 | | |
| Springfield..... | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 57,527 | 0 | | |
| Joplin..... | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | | 1 | 33,454 | 2 | | |
| Columbia ³ | | | | | | | | | | | | (?) | 14,967 | 16 | | |
| <i>County</i> | | | | | | | | | | | | | | | | |
| St. Louis ⁴ | 33 | 67 | 95 | 96 | 91 | 78 | 33 | 22 | 10 | 7 | 3 | 535 | 211,593 | 252 | | |
| Jackson ⁵ | 0 | 0 | 9 | 28 | 42 | 15 | 8 | 13 | 5 | 2 | 2 | 124 | 70,708 | 175 | | |
| Boone ⁶ | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 0 | 2 | 1 | 2 | 9 | 30,995 | 29 | | |
| Audrain..... | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 22,077 | 4 | | |
| Bates..... | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 22,068 | 4 | | |
| Buchanan..... | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 98,633 | 2 | | |
| Carroll..... | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 19,940 | 4 | | |
| Cass..... | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 20,962 | 4 | | |
| Clay..... | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 26,811 | 3 | | |
| Clark..... | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 3 | 10,254 | 29 | | |
| De Kalb..... | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 10,270 | 9 | | |
| Dunklin..... | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 35,799 | 2 | | |
| Franklin..... | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 30,519 | 3 | | |
| Greene..... | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 82,929 | 2 | | |
| Henry..... | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 23,931 | 1 | | |
| Hickory..... | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 6,430 | 15 | | |
| Jefferson..... | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 3 | 27,563 | 10 | | |
| Knox..... | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 9,658 | 10 | | |
| LaFayette..... | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 29,259 | 3 | | |
| Lawrence..... | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 23,774 | 1 | | |
| Montgomery..... | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 13,011 | 7 | | |
| Morgan..... | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 10,968 | 9 | | |
| Nodaway..... | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 26,371 | 3 | | |
| Phelps..... | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 15,308 | 6 | | |
| Polk..... | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 17,803 | 5 | | |
| St. Charles..... | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 1 | 0 | 4 | 24,351 | 16 | | |
| Saline..... | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 30,598 | 3 | | |
| Shelby..... | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 1 | 0 | 4 | 11,983 | 33 | | |
| Stoddard..... | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 27,452 | 3 | | |
| Total for State..... | 36 | 83 | 152 | 245 | 258 | 219 | 114 | 85 | 66 | 33 | 24 | 1,315 | 2,458,308 | 736 | | |

¹ United States census, 1930.

² Number of cases comprised in figures for Jackson County.

³ Number of cases comprised in figures for Boone County.

⁴ Outside St. Louis City.

⁵ Excluding Kansas City, including Independence.

⁶ Including Columbia.

⁷ For whole State, including counties for which no cases were reported.

regions of the State which were most heavily affected, one (St. Louis) is on the east border of the State and the other (Independence) is near the west border about 300 miles from St. Louis and that, with the exception of Columbia in Boone County, there were very few cases reported in the cities and the 7 counties along the main lines of travel between St. Louis County and Jackson County. In the three counties adjacent to St. Louis County, with a total population of 82,436, only 8 cases were reported—4 in St. Charles, 1 in Franklin, and 3 in Jefferson—and in none of the 7 counties along the main line of travel between St. Louis and Jackson County was a case reported.

Within the period August 1 to October 21, not a case was reported in either Jefferson City, with a population of 21,596, or in Sedalia, with a population of 20,806. Both of these cities are on the main current of travel between St. Louis and Kansas City. The State Fair, which was attended by many persons from the St. Louis and Independence regions, was held at Sedalia August 12 to 19, inclusive, when the period of causation of the disease in the St. Louis region was, presumably, at its height. Columbia and Independence, which cities are somewhat offside from the main current of travel between St. Louis and Kansas City, were stricken—the former moderately and the latter very severely. The incidence in Independence and in the zone about 6 miles wide (in Blue Township, Jackson County) between that city and Kansas City was much higher than the rate in St. Louis City and County. As nearly as the population can be estimated, the incidence in the area (of Blue Township) lying between Independence and the northeast section of Kansas City was 1 case to about 125 of population. In Jackson County outside Independence, Blue Township, and Kansas City, not a case was reported.

In Kansas City, with a population of 399,746, only 16 cases were reported to the State board of health between August 1 and October 21. The records of the Kansas City Health Department, however, showed on September 28 that 33 cases developing in the city had been reported to that department since August 1. It is exceedingly doubtful that as many as 100 cases actually occurred among residents of Kansas

City during the epidemic. At even such liberal estimate the case incidence in that city would have been only 1 to about 4,000 of population. It appears that a large proportion of the cases developing in Kansas City were in persons residing in the northeastern section of the city near the Jackson County (Blue Township) line.

In East St. Louis, Ill., with a population of 74,347, directly across the river from St. Louis, Mo., and connected therewith by bridges over which there is a constant current of traffic, only 3 local cases were reported between August 1 and September 25, but in Collinsville, Ill., a scattering village of 9,235 population located about 6 miles east of the city limits of East St. Louis, 4 local cases were reported within that period.

In Chicago, Ill., with a population of about 3,500,000, only 3 cases of encephalitis lethargica among residents were reported between August 1 and September 29. The number of cases reported in 1932 was 21 and the number reported in the period January 1 to August 1, 1933, was 6. In view of the tremendous amount of traffic between Chicago and St. Louis and Kansas City, the fact that Chicago was not reached by the epidemic is significant.

If encephalitis lethargica has an incubation period of 1 or 2 weeks, or more, as is assumed—apparently without definite reasons—by some observers, it is remarkable that a considerable number of persons while incubating the “infection” did not go from the epidemic areas to Chicago and have the onset of the disease while there. If the disease is caused by an infection which is transmitted either through personal contact or by flying insects, such as mosquitoes, which will travel by train, Chicago’s complete escape from the epidemic would be difficult to understand, unless the incubation period (if any) of the disease is very short and the “infection,” if conveyed by insects, is harbored by the “carrier-insects” for only a short period—less than 12 or 24 hours.

In Louisville, Ky., with a population of 307,745, located about the same distance by automobile or train travel from St. Louis as is Chicago, 28 cases of, with 9 deaths from, encephalitis lethargica were reported among residents of the city between August 1 and Septem-

ber 21, 1933. In addition to these, about 20 suspected cases were reported. Judging by the records of the city health department and the findings in the survey of the situation, the probability is that approximately 60 cases of the disease developed among the residents of Louisville in the period August 10 to October 10. A large majority of the cases were among persons residing in one or the other of two outskirts of the city about 6 miles apart.

Why was there such a distribution of the disease in the epidemic? Why did the incidence become less as the densest centers of population farthest away from the affected suburban zones were approached in St. Louis City and Kansas City and Louisville? Why did not the disease follow the main currents of human travel? Why did Jefferson City, Sedalia, and Chicago entirely escape? Why did Columbia have a fairly high prevalence? Why did Collinsville have a rate of incidence of the disease 10 times that of East St. Louis? Why were the cases in Louisville mainly in persons residing in one or the other of two outlying sections of the city about 6 miles apart? The answers to these questions should lead to sound epidemiological conclusions as to the mode of spread of the disease.

Judging by the reports recently received, it appears that with the advent of cool or cold weather in each of the heavily affected areas, the disease promptly ceased to prevail in epidemic proportions—in the Independence region somewhat before it did in the St. Louis region, although the epidemic began in the former region 2 weeks or more later than it did in the latter. The decline and the practical termination of the epidemic with the advent of cool or cold weather may be, of course, entirely coincidental and present no relationship of cause and effect: but to our elder epidemiologists it is somewhat *remindful of the observations on yellow fever incidence in the days prior to 1900 when that disease, too, was a "mysterious malady."*

General Considerations

The high rate of incidence of encephalitis lethargica in persons in the older age groups, the rapid spread of the disease over large areas in the regions affected, and all of the other gen-

eral epidemiological features suggest that in this epidemic in Missouri we were dealing with a new or a comparatively new disease or a new type of an old disease. At the beginning of these studies the nature of the causative agent of the disease was entirely unknown.

So far as the writer was informed, it has not been definitely determined whether the causative agent is a microscopically visible organism, a filtrable virus, or a toxin. Therefore, it seems right throughout the course of the studies to try to keep entirely open-minded, to be not overly influenced by superficial appearance of analogy with any other disease, to consider constantly the possibility that in this epidemic of encephalitis we were dealing with a disease or a type of disease different from any other which previously had prevailed in this country or, perhaps, in any other country, to collect facts carefully and thoroughly, and to consider every possible factor which might operate in the causation and spread of this disease.

The geographic distribution of the epidemic appeared to furnish a lead. There must have been some definite difference between the communities which were heavily affected and those which were lightly affected or not affected at all. The determination of these differences and whether they were consistent seemed highly important. In the areas heavily affected, the disease appeared to attack in about the same proportion rich and poor, white and Negro, and persons of different national descents. Difference in sources of water supplies for drinking and culinary purposes in two or more adjacent areas did not appear to affect the prevalence of the disease. Difference in food habits did not appear to affect prevalence. No evidence was found of a disproportionately high prevalence of the disease among users of milk, ice cream, or any other food from any one source. Therefore, it seems that if either water supplies or food supplies had operated in the spread of the disease all of the supplies in the large areas affected would have to have been about equally involved.

The first 2 days of these studies (September 18 and 19) were spent by the writer in the St. Louis region for conference and observation with other officers engaged in intensive studies in that region. We made repeated trips back

and forth over the St. Louis City line through different parts of the then heavily affected, thickly built-up suburban zone in St. Louis County.

As the city line was crossed going into the suburban zone, one difference was striking and very apparent. In the city area there were both sewage and sewerage. In the suburban area there was sewage but no adequate sewerage. In the city the sewage is carried away by trunk sewers to the disposal plants and eventually to the river. In the suburban zone, which is a section of hills and dales, there is no general sewerage system and the sewage from the small municipalities and from the thousands of dwellings and places of business is carried by small municipal sewers or by private or individual sewers direct from toilets or from cesspools or septic tanks to nearby creeks or streams. These heavily polluted open streams are very offensive to sight and smell. Even if they had nothing to do with the causation or spread of any disease, they are bad. They should not be tolerated in any community.

Since the rainfall in this region in the summer of 1933 was less than that for any of many previous summers, sewage was concentrated to an unusual degree in these creeks in the summer and early fall of this year. Mosquitoes, mainly (or almost solely) *Culex pipiens*, were breeding in myriads in these heavily sewage-polluted creeks. The citizens generally in these areas stated that mosquitoes were much more numerous and much more of a pest this season than they had been for many years before. Surgeon L. L. Williams, Jr., stated that *C. pipiens* and *Culex quinquefasciatus* mosquitoes bred under such conditions are capable of and addicted to long flights—2 miles or more. Anyhow, in September of this year, *C. pipiens* mosquitoes were observed from time to time in rooms in some of the farthest downtown leading hotels of St. Louis. The probability is that they were present more or less in all parts of the city, but most abundant in the outlying western areas.

Mosquito breeding in open sewage-polluted creeks was kept in mind in the course of the observations in other communities. East St. Louis is located in a flat, river bottom area instead of in one of hills and dales, and there

was comparatively little, if any, mosquito breeding in exposed heavily sewage-polluted streams or other waters. Collinsville, Ill., however, is located in an area of hills and dales—very similar to that of the St. Louis County zone—and there was observed on each of the two sides of the village a heavily sewage-polluted creek in which in September mosquitoes (*C. quinquefasciatus*, mainly) were breeding in myriads. In the Independence and Blue Township region between Independence and Kansas City creeks were heavily sewage-polluted and *C. pipiens* were breeding therein to a much greater degree apparently than in the St. Louis County region as a whole. Columbia, Mo., presented this condition to a considerable degree. Kansas City, Jefferson City, Sedalia, and Chicago appeared free from it. Louisville, Ky., presented it to a marked degree in the immediate vicinity of each of the two areas in which encephalitis was highly prevalent.

Thus, throughout the limited observations made by the writer, the abundance of sewage-bred mosquitoes (*C. pipiens* or *C. quinquefasciatus*) appeared to be the only consistent factor of difference between communities which were heavily affected by encephalitis in this epidemic and those which were not affected or only slightly affected.

This one fact is not conclusive but it is suggestive and, therefore, seems worthy of careful consideration and further study. It is possible, of course, that some other insect, such as the sandfly or buffalo gnat (Simuliidae), or some unusual large fly or one not yet even thought of is the vector; but the evidence obtained in the course of these studies points to the mosquito as the most likely conveyor—if the disease is conveyed by insects. Every fact observed in the places visited by the writer seems in line with the hypothesis of mosquito conveyance and not one fact observed is in conflict with it. Thus, hypothesis passes into theory.

The geographic distribution and most other general features of the epidemic appear definitely out of line with the other much discussed hypothesis—and the one yet favored by some of the observers—that the disease is caused by an infection discharged in the secretions from the upper respiratory passages of patients and "carriers" and is transmitted

from person to person through direct and indirect personal contact. In the outbreak of malignant smallpox in Kansas City and vicinity in 1921 and in the influenza epidemic of 1918, the epidemiological pictures were very different from that of this encephalitis epidemic.

In view of the fact that only one person in about a thousand in the St. Louis region developed encephalitis in the course of the epidemic, negative results from human experimentation evidently would have to be produced on a large scale—involving hundreds of persons—to tend to nullify the mosquito conveyance hypothesis or any other reasonable hypothesis.

In considering the hypothesis that encephalitis is caused by a micro-organism, a virus, or a toxin conveyed to susceptible persons by mosquitoes, a number of interesting questions arise, such as the following:

1. Do the mosquitoes before becoming capable of conveying the causative agent have to feed on the blood of a person ill with the disease, or of one harboring the causative agent without being ill, and carry the agent through a developmental cycle as is the case with yellow fever and malaria?

2. May adult mosquitoes become capable of conveying the causative agent mechanically—as appears to be the case with some of the insects which convey the infections of some of the trypanosomiasis—after feeding on the blood or some of the secretions or excretions of a person (ill with the disease or before, after, or without illness) harboring the causative agent?

3. May mosquitoes while in the larval stage acquire the causative agent in their feeding on matter polluted with human excretions or secretions or on other matter and continue to harbor the agent and be capable after reaching adult life of conveying the agent to persons by biting or otherwise?

4. If mosquitoes become loaded with the agent before leaving their breeding places (as appears to be the case with the mites which convey the infection of tsutsugamushi fever) is it one out of many—thousands or millions—or a considerable proportion of them which becomes loaded?

5. Is the causative agent harbored by the

loaded mosquitoes for a period of days or weeks or for only a few hours after leaving their breeding places?

6. Is one loaded mosquito capable of conveying the causative agent to a susceptible person by one bite or are a number of bites by one or many loaded mosquitoes required?

7. Do other animals—such as poultry, birds, cows, horses, squirrels, rodents, or even fish or reptiles (dead or alive)—serve as sources of the causative agent from which mosquitoes may transmit the agent to man?

8. Are persons who “do not mind” mosquitoes, and who sit out in the open after dusk of evening and “take them,” more likely to contract encephalitis than are persons who are “poisoned” by mosquitoes and who try to get away from them?

9. Is it possible that the part of the body bitten is a determining factor, as is the case with rabies virus, tending to explain why elderly persons with well-clad bodies and whose faces and necks present the main field of attack for mosquitoes are more likely under comparable conditions of exposure to loaded mosquitoes to have the causative agent conveyed effectively to them than are lightly clad young persons whose legs and arms present the main area of attack?

10. Are persons with foul mouths and offensive breaths or with otitis more likely while sleeping under cover at night to attract *C. pipiens* mosquitoes to their heads and necks than are persons with clean mouths sleeping in the same rooms or houses?

Most of these questions, presumably, will have to be answered, if at all, by the findings from future studies; but if in the meanwhile the spread of encephalitis is not proved to be due to some agent or agency other than mosquitoes, these questions are and will be serious practical ones.

The sudden spread of the disease over large areas, the very unusual occurrence of more than one case in one family, and the other general features of the epidemic seem to suggest that if the causative agent is conveyed by mosquitoes, it is conveyed by filth-breeding and filth-loving mosquitoes (*C. pipiens*) which, in rare exception or in considerable proportion, come “loaded” from some of their breeding places and are capable for a short time of conveying

the causative agent without previously having fed on the blood of a person or other living animal.

Incidence in Institutions

Institutions, of which there are quite a number in the outskirts and suburbs of St. Louis City, seemed to furnish especially strategic situations for studies of encephalitis. Four institutions were visited. The first one, an institution for mental cases administered by Sisters of Charity, had a population, including personnel and inmates, of about 400. It is located on a hill about 2 miles from Clayton in St. Louis County and in a zone in which encephalitis was highly prevalent. All parts of the building were found to be well screened and otherwise in excellent hygienic condition. Not a case of encephalitis developed at that institution during the epidemic.

On a hill in one of the outskirts of the city in the vicinity of a section of the St. Louis County zone which was quite heavily affected are three city institutions, the Hospital for the Insane, the Isolation Hospital, and the Infirmary (Almshouse). They face north on the same street and are in adjacent grounds. The Isolation Hospital is in the middle. The prevailing winds are from the south. All three are supplied with milk, meat, vegetables, and other foods purchased by the city from the same contractors. All three obtain their water supplies from the same source, the city public supply.

At the time of the survey, on September 25, the Isolation Hospital and the Hospital for the Insane were found to be well screened and otherwise in excellent structural condition, but the Infirmary was found to be poorly screened and in some parts in need of structural repair. Doctors, nurses, and other persons in each of these institutions were queried regarding mosquitoes in wards and other sleeping quarters at night. The report for the Isolation Hospital and the Hospital for the Insane was that very rarely was a mosquito noticed in the sleeping quarters, but the report for the Infirmary was that mosquitoes were abundant and very troublesome in the sleeping quarters. At the Isolation Hospital, in which over 300 cases of

encephalitis had been treated during the epidemic, not a case had occurred among the personnel. At the Hospital for the Insane with a population, including personnel and inmates, of about 4,000, not a case had occurred.

At the Infirmary, with a population, including personnel and inmates, of about 1,200, 13 cases of encephalitis had developed during the epidemic. Two of these were in female attendants who were domiciled with six other female attendants in a large ward on the second floor of the south side of the building. The first case was in an attendant who slept in a bed directly in front of the door leading from an open porch into the ward. The screen on this door had sagged and furnished little protection against mosquito invasion. The second case, developing 6 or 7 days after the first, was in an attendant whose bed was at the same end of the ward and located a few feet toward the wall from that of the attendant who developed the first case. The other six attendants who were domiciled in this ward and who were not stricken with the disease slept in beds located at the other end of the ward in the part of the quarters farthest away from the door. The space of about 40 feet between the set of 2 beds and the set of 6 beds was used as a lounge.

At both the Hospital for the Insane and the Infirmary, contact through visitors and otherwise with the outside world was free during the epidemic; but, for obvious reasons, there was more restriction at the Hospital for the Insane than at the Infirmary with respect to permitting inmates to visit homes in the community and go out into and sit around in the institutional grounds after sundown.

Intensive Studies in the Independence Region

The encephalitis studies in the region of Independence were begun on September 19 and were terminated on September 28. They comprised (a) a survey of sanitary and other general conditions in the community, (b) examination of the morbidity and mortality records of the health office of Independence City and of the Jackson County Health Department, (c) a search for mosquito breeding places in the vicinity, (d) visits to homes and collection of detailed epidemiological histories

of 19 cases of encephalitis among residents of Independence City and of 28 cases among residents of Blue Township in Jackson County.

Independence is the seat of government of Jackson County. It is an attractive little city with rolling topography, wide, clean streets and well-kept homes, and without serious overcrowding in any part. Economic conditions generally appear considerably above average for cities of its size. The land area is about 3 square miles and the population in 1930 was 15,296, 14,450 whites and 846 Negroes (U. S. Census). Of the whites, only 488 are foreign-born.

Independence is located east of the northeast section of Kansas City, the distance by road between the limits of the two cities being about 6 miles. The public water supply, furnishing over 90 percent of water used for drinking and culinary purposes in the city, is obtained from the Kansas City supply. The milk supplies and other dairy products distributed in the city are from Kansas City and from local dairies and nearby dairy farms. About 50 percent is said to be pasteurized and most of the remainder to be grade A raw. Practically all meats sold in the city are distributed by Kansas City dealers. Vegetables are mainly from Kansas City markets and nearby farms.

About 80 percent of the private dwellings and public places are connected with the city sewers and the remainder are provided with septic tanks, cesspools, or privies. The main trunk sewer, carrying about two-thirds of the city's sewage, discharges into Rock Creek, a shallow stream ranging in width from 3 to 10 feet, meandering in and out along the southern outskirts of the city, and finally discharging into a lake in Mount Washington Cemetery about 1 mile from the eastern limit of Kansas City. The sewage before discharge into the creek (in the south central outskirts of the city) goes through some sort of sedimentation treatment which evidently is inadequate because the sewage was found highly putrescible after it entered the creek. Samples of water dipped from Rock Creek and from other heavily sewage-polluted creeks in the other outskirts or suburbs of the city were found, on September 22, to be literally teeming with mosquito larvae, which on examination proved to be *C. pipiens*.

The locally prevailing winds are from the south.

Local Prevalence of Encephalitis

Independence was severely affected by the encephalitis epidemic. From August 19 to October 21, 1933, 63 cases with 14 deaths were reported among the residents of the city. Sixty cases were in white persons and 3 were in Negroes. The case incidence for the whole period of the epidemic in Independence was 1 to about 250 of population.

Blue Township in Jackson County, especially that part lying between Independence and Kansas City, was also severely affected. In that intercity zone the case incidence was 1 to about 125 of population. The population of Jackson County, exclusive of Independence and Kansas City is 55,406. Of them, 27,356 reside in Blue Township outside Independence. In this total rural population of Blue Township there were reported from August 19 to October 14, 1933, 61 cases of encephalitis with 8 deaths, a case incidence of 1 to about 450 of population.

In the total population of 28,056 in the other rural townships of Jackson County not a case was reported within that period. All cases

Table 2. Distribution of cases of encephalitis lethargica in Independence and Blue Township, Mo., by age and sex, 1933

| Age (years) | Independence | | | Blue Township | | | Total |
|-------------|--------------|--------|-------|---------------|--------|-------|-------|
| | Male | Female | Total | Male | Female | Total | |
| 0-4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5-9 | 0 | 0 | 0 | 3 | 0 | 3 | 3 |
| 10-14 | 2 | 0 | 2 | 4 | 1 | 5 | 7 |
| 15-19 | 1 | 1 | 2 | 1 | 1 | 2 | 4 |
| 20-24 | 0 | 0 | 0 | 0 | 2 | 2 | 2 |
| 25-29 | 5 | 2 | 7 | 1 | 2 | 3 | 10 |
| 30-34 | 0 | 1 | 1 | 4 | 3 | 7 | 8 |
| 35-39 | 3 | 2 | 5 | 5 | 4 | 9 | 14 |
| 40-44 | 0 | 2 | 2 | 1 | 4 | 5 | 7 |
| 45-49 | 0 | 4 | 4 | 1 | 0 | 1 | 5 |
| 50-54 | 3 | 2 | 5 | 2 | 3 | 5 | 10 |
| 55-59 | 5 | 2 | 7 | 1 | 1 | 2 | 9 |
| 60-64 | 0 | 1 | 1 | 1 | 1 | 2 | 3 |
| 65-69 | 5 | 2 | 7 | 1 | 2 | 3 | 10 |
| 70-74 | 2 | 2 | 4 | 0 | 1 | 1 | 5 |
| 75-79 | 0 | 0 | 0 | 3 | 1 | 4 | 7 |
| 80-84 | 3 | 2 | 5 | 0 | 1 | 1 | 6 |
| 85-89 | 1 | 0 | 1 | 0 | 0 | 0 | 1 |
| Total | 30 | 23 | 53 | 28 | 30 | 58 | 111 |

Table 3. Incidence of encephalitis lethargica in Independence, Mo., by age and sex, 1933

| Age (years) | Population | | | Cases | Incidence of cases to persons |
|------------------|------------|--------|--------|-------|-------------------------------|
| | Total | Male | Female | | |
| Under 5..... | 1, 170 | 607 | 563 | 0 | 0-1, 170 |
| 5-9..... | 1, 367 | 726 | 641 | 0 | 0-1, 367 |
| 10-14..... | 1, 326 | 636 | 690 | 2 | 1-663 |
| 15-19..... | 1, 308 | 656 | 652 | 2 | 1-654 |
| 20-24..... | 1, 533 | 736 | 797 | 0 | 1-1, 533 |
| 25-29..... | 1, 339 | 635 | 704 | 7 | 1-191 |
| 30-34..... | 1, 061 | 503 | 558 | 1 | 1-1, 061 |
| 35-44..... | 2, 045 | 962 | 1, 083 | 7 | 1-292 |
| 45-54..... | 1, 728 | 824 | 904 | 9 | 1-192 |
| 55-64..... | 1, 256 | 611 | 645 | 8 | 1-157 |
| 65-74..... | 768 | 346 | 422 | 11 | 1-69 |
| 75 and over..... | 388 | 194 | 194 | 6 | 1-64 |
| Unknown..... | 7 | 4 | 3 | 5 | ----- |
| Total..... | 15, 296 | 7, 440 | 7, 856 | 58 | 1-264 |

reported in Blue Township outside Independence were in white persons. In the rural part of the township, only 60 Negroes reside. The area of Blue Township west of Independence, which probably was more heavily stricken by the epidemic than any other area of considerable population, is hilly. In the dales between the hills are numerous creeks. Most of these creeks are polluted with sewage and are heavily polluted in periods of drought such as that of the summer of 1933. Samples of water dipped from a number of places in those creeks on September 22 were found to contain myriads of *C. pipiens* larvae. The report from the residents generally was that mosquitoes were much more abundant in July, August, and September of this year than in the corresponding months of any previous year within their recollection. The opportunity for the breeding of mosquitoes in heavily sewage-polluted water in this region, in proportion to population, seemed several times as great as that furnished in the St. Louis County region.

The zone between Independence and Kansas City is quite thickly built up, resembling for the most part a scattering village. The majority of the residents appear to be in good or fair economic circumstances. Most of the water used for drinking and culinary purposes in this zone is piped from the Kansas City supply. The large majority of the homes seem well constructed and well kept. It was surprising to

find among the streets at the front of some of the rows of those attractive homes gutters filled with and flowing with highly offensive sewage.

Dates of Onset of Cases

In a large majority of the cases especially investigated, the onset of definite illness was sudden or after a prodromal period of only a day or two. The dates of onset (usually those upon which the patient took to bed) of 51 cases in Independence and of 59 cases in Blue Township (outside Independence), whose histories on this point were obtained, were evenly distributed throughout August and September. [Tabulation omitted.—*EDITOR.*]

Age and Sex

The occurrence of cases of encephalitis among 111 persons in different age-sex groups is shown in table 2. It is interesting to note that in persons under 15 years of age the case incidence was much higher among males than among females.

The case incidence among persons in different age groups among 15,296 residents of Independence is shown in table 3.

Table 4 presents the number of persons in the different age groups in the rural farm and the rural nonfarm population of Jackson County, the number of cases of encephalitis in each of

Table 4. Incidence of encephalitis lethargica in Jackson County, Mo., by age and population group, 1933

| Age (years) | Population | | Number of cases | Relative but not actual case incidence |
|------------------|------------|----------------|-----------------|--|
| | Rural farm | Rural non-farm | | |
| Under 5..... | 1, 292 | 4, 042 | 0 | 0-4, 042 |
| 5-9..... | 1, 559 | 4, 384 | 3 | 1-1, 461 |
| 10-14..... | 1, 645 | 3, 706 | 5 | 1-741 |
| 15-19..... | 1, 415 | 3, 177 | 2 | 1-1, 588 |
| 20-24..... | 1, 042 | 3, 017 | 2 | 1-1, 508 |
| 25-29..... | 917 | 3, 396 | 3 | 1-1, 132 |
| 30-34..... | 1, 006 | 3, 322 | 7 | 1-474 |
| 35-44..... | 2, 215 | 5, 724 | 13 | 1-440 |
| 45-54..... | 1, 971 | 3, 696 | 5 | 1-739 |
| 55-64..... | 1, 450 | 2, 524 | 4 | 1-631 |
| 65-74..... | 918 | 1, 697 | 4 | 1-424 |
| 75 and over..... | 326 | 923 | 8 | 1-115 |
| Unknown..... | 22 | 22 | 5 | ----- |
| Total..... | 15, 778 | 39, 630 | 61 | 1-640 |

the age groups, and, since the large majority of the cases were in the nonfarm residents, the case incidence based on the nonfarm groups of the population.

Findings at Affected Homes

In the course of epidemiological studies, the ascertainment of definite information as to the possibly salient conditions to which the persons affected with encephalitis have been exposed prior to illness is of primary and fundamental importance. Therefore, visits to the homes of persons in which cases of encephalitis had developed in the Independence region were begun with interest and with an effort toward complete openmindedness.

Of the affected homes, 18 in the city and 27 in the township (outside Independence) were visited. At the second home visited, a history was obtained that within the 3 weeks prior to the onset of the patient's illness, 25 of about 100 chickens kept in the yard had died of some sort of convulsive disease. At the fourth and fifth homes, a history was obtained that within several weeks prior to the development of each case, goldfish kept in a bowl in the house or in a rock garden in the yard had been dying. At the seventh home visited, the wife had captured three strange insects in the bedroom of her husband the day he became ill with encephalitis. These insects, resembling somewhat the drones of honey bees, were later identified at the St. Louis headquarters of the studies as moths of unusual occurrence in that part of the world. The convulsive chickens, the sick goldfish, and the strange moth tales, however, did not continue, no history of any of them being obtained at any of the other stricken homes visited.

Especial consideration was given to the possibility of the encephalitis epidemic having been caused by a toxin—comparable to that of botulism—conveyed in some widely distributed canned or otherwise prepared food, but the histories of the cases definitely eliminated such etiological possibility. Attention also was given to the possibility of unhealed wounds, sores, bad tonsils, and diseased gums serving as a nidus of infection. The proportion of cases among persons with diseased gums was found to be quite interesting.

Possible Susceptibility Factors. No evidence was obtained to suggest that hay fever, asthma, hives, herpes, previous attack of any infectious disease, vaccination against smallpox, or immunization against diphtheria or typhoid fever tended to make one especially susceptible to the disease.

Of the 47 cases of encephalitis intensively studied in the Independence region, only 4 were in persons who gave a history of frequent colds or sore throat prior to onset of the illness, only 6 were in persons who had bad tonsils, 3 were in persons who were subject to fever blisters, 12 were in persons who during the 2 weeks or more prior to illness had unhealed wounds or sores, and 24 were in persons who had diseased gums and/or badly decayed teeth. Definite histories of mouth conditions were obtained for 18 city cases and 22 township cases. The 18 city cases were in persons who during the 2 weeks or more prior to their onsets of encephalitis had mouth conditions as follows: 10 with Riggs' disease, 2 with Vincent's angina severely affecting the gums, 4 with false teeth, and only 2 with healthy gums and sound natural teeth. The 22 township cases were in persons who during the 2 weeks or more prior to their onsets of encephalitis had mouth conditions as follows: 12 with Riggs' disease, 2 with false teeth, and 8 with healthy gums and sound natural teeth. In a sufficient proportion of instances to be somewhat impressive, the one member of a family who had a foul mouth was the one member who developed encephalitis.

Water and Foods

There was no evidence that any water supply used for drinking operated as a factor in the spread of encephalitis. The distribution of cases among users of the different water supplies was in close proportion to the numbers in the general population exposed to the different supplies.

No evidence was obtained pointing to milk or any milk product as a factor in the spread of the disease. The number of cases among the users of milk from the different milk supplies of the community was as nearly proportionate to the amount of the milk distributed by the different dealers as could be expected with such a limited number of cases. There

was no disproportionately large number of cases among consumers of milk or any other dairy product from any one source. The heavier milk drinkers and ice cream consumers of the affected families generally escaped the disease. A large majority of the cases were in persons who used milk sparingly (in coffee or on cereals) or not at all.

No evidence was obtained to suggest that meat, vegetables, or fruit, or any other food supplies were a considerable factor in the spread of the disease. Only 5 of 18 cases in the Independence group and only 4 of the 24 cases in the Blue Township group—whose histories on this point were obtained—were in persons who, within the 3 weeks prior to onset of illness, ate any food or drank any beverage of an unusual nature either at or away from home to which other members of their families were not also exposed. The incidence of the disease appeared less among beer drinkers than among nonbeer drinkers in the community, and there was no suggestively large proportion of cases among those who habitually drank beer of any one particular brand.

Sanitary and Hygienic Conditions. The large majority of the encephalitis cases were in persons residing in dwellings with apparently good sanitary and hygienic conditions, excepting that with respect to exposed sewage in the street gutters and nearby creeks.

Animals on Premises. The presence of animals at the 18 affected homes visited in the city and in 27 affected homes visited in the township was determined.

Unusual Insects. In 18 of the affected city homes visited, large gray flies of an unusual kind were reported to have been present in large numbers at 4 and small black flies at 2. In 27 of the affected township homes visited, large black flies of an unusual kind were reported to have been present at 1, bottle flies (in large numbers) at 1, and small black flies at 1.

Personal Contact. Among the 122 homes in which cases were reported in the encephalitis epidemic in the Independence region there were only two instances of more than one case in a home. Two cases occurred in one of the homes in the city and two in one of the homes in Blue Township. The interval between the on-

sets of the two cases in the city homes was 25 days and that between the onsets of the two cases in the township home was 7 days. The affected households in the zone averaged 4.5 persons. Therefore, the total number of persons who did not develop the disease in those 122 households was about 425. The case incidence in the Independence region was 1 to about 200 of population. In view of these data, it seems that residence in a home with a case of encephalitis did not increase the risk of contracting the disease.

Of the 47 cases specially studied, only 3 gave a history of direct association and only 1 of indirect association (through another member of the family) with previous cases of encephalitis, and among these 3 are included the 2 cases developing in previously affected households. Thus, it appears that if personal contact operated as a considerable factor in the spread of the disease, it must have done so in a very quiet, mysterious, and obscure manner.

The persons not developing the disease in the stricken households of the Independence region were, according to the histories obtained, remarkably free during the period of the epidemic from ailments of a sort to suggest the possibility of a mild case of encephalitis. In only 2 of the 45 households visited were histories obtained of such ailments in other members of the household. In one a son of the patient suffered with a "cold" during the 2 weeks prior to onset of the encephalitis case, and in the other the wife of the patient had an "intestinal upset" for 2 days about 1 week before the development of the encephalitis case.

Two instances were discovered of the occurrence of more than one case of encephalitis among persons at place of occupation—one at a public school in the city, where a librarian and a janitor had their onsets of illness 5 days apart, and the other at a printing office in the city, where the cashier had her onset of illness on August 22, and her successor at the desk, on August 29, 6 days after going on the job.

Biting Insects. Of the encephalitis cases especially studied, 19 city cases and 28 township cases, 9 had a history of having been bitten by insects other than mosquitoes 2 or 3 weeks prior to the onset of illness. In the city, 4 persons

had been bitten by small black flies or gnats and 1 by large black flies. In the township, 2 persons had been bitten by fleas, 1 by large black flies, and 1 by small black flies.

Every one of the persons who developed the disease gave a definite history of having been bitten by mosquitoes frequently and many times during the period of 3 or 4 weeks immediately prior to, and extending to a time within a few hours of, onset of illness. Thus, mosquitoes appeared to be the only biting insect to serve as the epidemiological common denominator to all the cases.

At each of the homes visited, the one member of the family who "did not mind" mosquitoes and who was not "poisoned" by them was the one who developed the case of encephalitis.

Discussion

The observations and reports on the encephalitis epidemic in Missouri in 1933 indicate that the flight of mosquitoes in the regions in which the disease was highly prevalent began to diminish about September 15, and by the end of that month was probably less than 10 percent of that of the period of maximum flight. Following a heavy rain and a pronounced drop in temperature in the night of September 26, both the flight and the larval life of mosquitoes suddenly decreased very much in the Independence region. Twenty-five dippings on September 28 from places in Rock Creek and in other polluted creeks in the vicinity showed only two live larvae. Every dipperful of water from those same places on September 22 had shown scores or hundreds of live larvae. Thus, it appears that the epidemic in each of the most heavily affected regions began and reached its height when and where mosquitoes (*C. pipiens*) were unusually and tremendously prevalent, decreased as the mosquito flight decreased, and ceased to prevail (in epidemic rate) when adult mosquitoes in the vicinity became scarce or ceased to travel. Such coincidences are significant.

The epidemic in Missouri this year seemed to present many epidemiological features similar to those of the epidemic in the Inland Sea

region of Japan in the summer of 1924. Mosquitoes found in the vicinity of Osaka have been identified as *C. quinquefasciatus* and/or *C. pipiens* (2). It would be interesting to ascertain whether they were unusually abundant in the Inland Sea region in the summer of 1924.

Conclusions

1. The preponderance of epidemiological evidence supports the hypothesis that encephalitis lethargica of the epidemic type which prevailed in Missouri and neighboring States in the summer and autumn of 1933 is caused by an agent (micro-organism, virus, or toxin) which is conveyed to persons by mosquitoes (*C. pipiens* and/or *C. quinquefasciatus*) which have bred under some set of unusual conditions in waters heavily polluted with human sewage, thereby becoming capable for a short period—perhaps only a few hours—of conveying the causative agent to persons by biting or otherwise without previously having fed upon the blood of a person or other living animal harboring the causative agent.

2. The installation of sewerage systems and other appropriate measures should be carried out as promptly and as thoroughly as may be practicable, before the summer of 1934, in every city, town, village, and suburban and other thickly settled community to prevent the breeding of *C. pipiens* and/or *C. quinquefasciatus* mosquitoes in surface streams, creeks, rivers, ponds, lakes, or other exposed collections of water which are or which are likely to become heavily polluted with human sewage.

3. From all the evidence obtained in the course of these studies, it appears improbable that water used for drinking and culinary purposes, milk or other foods, insects other than mosquitoes, or personal contact, either separately or together operated as very considerable factors in the spread of the disease.

4. Persons generally, and especially those over 50 years of age, in communities in which encephalitis prevails or is likely to prevail in epidemic rate should hasten to secure needed corrective work to put their gums and teeth in hygienic condition.

5. Encephalitis lethargica should be made a reportable disease by Federal, State, and local health agencies.

6. Studies of the cause and mode of spread of encephalitis should be continued unceasingly and adequately until complete practical knowledge of the subject becomes available.

REFERENCES

- (1) Leake, J. P.: Encephalitis in St. Louis. J. A. M. A. 101: 928-929, Sept. 16, 1933.

- (2) Howard, L. O., Dyar, H. G., and Knab, F.: The mosquitoes of North and Central America and the West Indies. Washington, D. C., Carnegie Institution of Washington, 1915, vol. 3, pt. 1, pp. 345-382.

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EDITOR'S NOTE: *The theory of mosquito transmission of encephalitis, detailed in the foregoing paper, was touched upon briefly in a paper read by Dr. Lumsden at the 29th annual meeting of the Southern Medical Association in St. Louis, Mo., in November 1935 and published in the March 1936 issue of the Southern Medical Association Journal, vol. 29, pp. 303-308.*

Air Pollution

Wagner College. The sixth annual symposium on air pollution and its control will be held at Wagner College, Staten Island, N. Y., on Saturday, April 26, from 9 a. m. to 4 p. m.

Participating in the symposium will be air pollution control officials from government and industry, and specialists in the fields of engineering agriculture and public health.

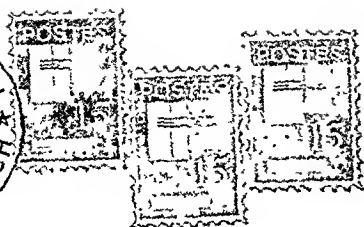
This year's program will emphasize the legal, technical, and legislative aspects of interstate air pollution control, and the contribution of industry to the abatement of atmospheric contamination.

The symposium is sponsored by Wagner's department of bacteriology and public health. Dr. Natale Colosi, chairman of the department, is in charge of the symposium.

University of North Carolina. Concentration of course work in air pollution, offered in fulfillment of the master's degree, has been announced by the School of Public Health of the University of North Carolina, Chapel Hill. Courses are open to sanitary scientists and sanitary engineers.

The department of sanitary engineering, which has a grant from the Community Air Pollution Program of the Public Health Service, will direct the studies.

University of Minnesota. Specialized graduate courses in air pollution will be offered in the spring quarter of 1958. This summer, from August 4-15, a workshop in air pollution will be open to qualified physicians, engineers, chemists, and other sanitation personnel. Inquiries should be addressed to Dr. Gaylord W. Anderson, Director, School of Public Health, College of Medical Sciences, University of Minnesota, Minneapolis 14.



Tax Victory

The health center in Concepción, Paraguay, won a victory when the municipality dropped its building tax on latrines. The levy of 250 guaranies equaled the total construction cost of the latrine, and made the price prohibitive to many families.

—M. A. TAFF, JR., *chief, health, welfare and housing field party, U. S. Operations Mission, Paraguay.*

Second Try

The paramount chief, two clan chiefs, district commission members, and the director of public health nursing spoke at the first graduation of a class of four unlettered midwives in Gbarnga, Liberia. Only the three midwives who failed to pass did not enjoy the festive occasion. Two of them remain undaunted, however, and are enrolled in the next class of 10 pupils. Recruiting for the midwives course goes on in all important clan areas. Classes are scheduled for 8 different locations, including the Gbarnga clinic.

—E. L. MASTHOFF, M.D., *medical officer, U. S. Operations Mission, Liberia.*

Pilgrims and Smallpox

After pilgrims returning from Kerbella, Iraq, introduced 21 smallpox infections in Iran, Iranian and Iraqi public health officers of the provinces along the common border met to develop a control plan. Dr. Franz Rosa, U. S. Operations Mission, Iran, visited Iraq for 5 days to help work out a joint and coordinated plan of action by the two countries to combat the disease.

Opportunities for the introduction of smallpox into Iran by Kerbella pilgrims resulted from several factors. Some travelers were not vaccinated as they left or reentered Iran. Nor were they immunized in Kerbella, where the disease has not been effectively controlled. Police and quarantine authori-

ties overlooked vaccinating or examining infants who were regarded as "baggage."

Infected ailing pilgrims were carried all the way across the country on buses; some were not even identified when they crossed through quarantine posts. Ineffective vaccination, illegal border crossings, false vaccination certificates, concealment of infected travelers, and failure to check certificates or to isolate cases also contributed to transmission of the virus.

Vaccination and quarantine measures have since been strengthened. Now only 10 percent of the pilgrims leaving the country are unvaccinated as they reach the border. Previously, a third of those returning from Iraq, having left Iran several months earlier, were not vaccinated. Every unvaccinated person that is seen at the border station is being immunized.

—GLEN W. McDONALD, M.D., M.P.H., *chief, Public Health Division, U. S. Operations Mission, Iran.*

Thai Promoter

The headman of Bang Tao, Thailand, is the strongest advocate of the privy program. After a trip to Bangkok he came back determined to promote in his own village the progress he'd seen in other parts of the country. As a result, enthusiastic participants in Bang Tao's health project have bought 300 privy slabs.

The villagers at first objected to the privies on the religious principle which forbids more than one human fecal deposit in the same place. Now installing a privy is the popular thing to do in Bang Tao. Slabs are sold at cost and the money put into a revolving fund to make additional slabs. Health department sanitarians assist in selecting sites and installing slabs.

Interest in health education and community organization ran as high in the 7 villages of Tambol Gatoo, our first demonstration area. Villagers as well as community health council members joined in the self-help project. Privy slabs have been selling almost as fast as they are produced; 500 have been installed.

Other phases of this project include protection of private and public water supplies, premise sanitation, and improvement of preventive and medical care facilities of the local health centers.

—ANDREW P. HAYNAL, *deputy chief, public health adviser, U. S. Operations Mission, Thailand.*

Oklahoma's Heart Disease Course for Multidisciplines

KIRK T. MOSLEY, M.D.

SCIENCE teaching has the responsibility of keeping workers in the field abreast of new developments. This task of communicating information to those responsible for translating scientific advances into health services for individuals, families, and communities is often complicated by the fact that this information cuts across many disciplines. Public health especially embraces a variety of services demanding broad understanding by many individuals working together to accomplish their purposes.

These people must be made to feel more competent in their own fields and to know how their services complement the services of workers in other disciplines.

Accordingly, a course on heart disease was offered at the University of Oklahoma, May 28-June 9, 1956, with the basic purpose of providing better services to heart disease patients through increasing the knowledge and skills of workers in various disciplines. The course was designed to show the importance of and give opportunities for a team approach by those with the various skills and technical abilities required to take care of the needs of the patients.

Representatives from voluntary and official agencies at local, State, and national levels participated in the planning meeting. National bodies represented were the American Heart Association, the National League for Nursing, and the Public Health Service. On the State

level those represented were the Oklahoma State Heart Association, Oklahoma League for Nursing, the Oklahoma State Health Department, and the School of Medicine, the School of Nursing, and the Extension Division of the University of Oklahoma. These State agencies subsequently became the co-sponsors of the course. Planning committee members included nurses, social workers, nutritionists, physicians, and educators.

The course of instruction, scheduled for 2 weeks, was offered by the department of preventive medicine and public health of the School of Medicine, through the Extension Division of the University of Oklahoma. Qualified students successfully completing the course received 2 hours of university credit.

Enrollment was limited to 30 with a special effort being made to enroll students representing a variety of disciplines. A total of 27 students attended all or part of the course. In this group were 8 physicians (health officers); 11 nurses, 5 of them from official health agencies, 4 from hospitals, 1 a private duty nurse, and 1 from a heart clinic; 4 dietitians; 1 nutritionist; and 3 social workers. Attendance at some sessions, counting resource persons from contributing agencies, rose to 50.

The faculty was provided by the School of Medicine and the School of Nursing of the University of Oklahoma, the Oklahoma State Health Department, the American Heart Association, the Oklahoma State Heart Association, and the Public Health Service.

The Oklahoma State Heart Association and the Oklahoma Department of Health each sponsored 15 tuition scholarships, and the lat-

Dr. Mosley is chairman of the department of preventive medicine and public health, School of Medicine, University of Oklahoma, Oklahoma City.

ter in addition paid for the maintenance of all department employees who attended. Secretarial help was provided by the heart association, the university, and the health department. Literature, films, slides, and mimeographed materials were provided by the heart association and health department. Classroom and other visual aid equipment was supplied by the medical school.

Instruction was offered in a variety of ways with emphasis placed on student participation and teamwork. Field visits, special conferences, and clinics occupied the morning sessions. After lunch the entire class assembled to hear lectures on subjects dealing with the physiology of the circulatory system, etiological factors and preventive aspects of heart diseases, and recent advances in research on the cardiac disorders. Following the lectures, students met in small groups for discussion and exchange of information about the field experiences in which they participated during the morning period. At a seminar session held the last hour of the day, students had an opportunity to discuss with a panel of appropriate experts a selected phase of the heart disease program.

Field Experience

For the field experience, one of the most successful aspects of the program, the class was divided into 5 small groups, each with students from 2 or 3 disciplines. Each member of a group was assigned a different type field activity each day, and no two members of the same group participated in the same activity together. For example, during a morning period, one member of a group might be assigned to observe bedside nursing care of a cardiac patient in a hospital, another member to accompany a public health nurse on a home nursing visit to a cardiac patient, a third member to visit the vocational rehabilitation office for a conference on the role of this agency in the rehabilitation of cardiac patients, and a fourth member to visit the food clinic and confer on diets for cardiac patients.

This arrangement provided the group with varied experiences and encouraged the exchange of information between group members.

Among the institutions and facilities visited as a part of the field experience were the Oklahoma Medical Research Foundation, Oklahoma State Heart Association, Department of Public Welfare, State Industrial Commission, physical medicine department of the Oklahoma School of Medicine, Crippled Children's Commission, a nursing home, cardiac catheterization clinic, medical wards, social service and dietetics departments of the University Hospitals, cardiac conferences for children and for adults, heart station where electrocardiographic examinations are made, rheumatic fever clinic, and a convalescent hospital. During the visit students were given an opportunity through discussion and conference to obtain a better understanding about the role of the agency or facility in providing services to heart patients.

"Handout" Materials and Tests

Three portfolios, Social Service Information, Nursing Information, and Nutritional Information, were distributed to each member of the class. Each of the portfolios contained 8 to 10 pieces of literature which had been obtained from the Public Health Service, heart association, or other sources. In addition to the literature, a carefully selected bibliography which included visual aid material was distributed. Thus, each student could take home from the course the most recent literature available for the various disciplines.

Tests before and after the course were given to gauge student progress. These tests comprised hypothetical family situations based on case material from the University Hospitals and health department files. The individual responses uniformly indicated an increasing knowledge about heart diseases and the problem of patients with heart diseases. The answers also revealed an increased awareness of the need to coordinate the services of professional workers responsible for the care of cardiac patients. The results of the tests reflected definite achievement toward the chief objective of the course, better care for the heart patient.

Followup Conferences

Approximately a year after the course, about 14 persons met with one of the instructors from

the Public Health Service for a followup conference. Through this group approach an attempt was made to get tangible evidence of the value of the course expressed in terms of better patient care. The remainder of the class were contacted by letter. These are some of the experiences reported:

- A nursing supervisor, who participated as a resource person, reported she had had a feeling of frustration after the course because she had been made aware that nurses in the hospital were not "nursing the patient." She is now director of the Baptist School of Nursing in Oklahoma City.

- A private duty nurse, who for 11½ years had been caring for a patient with cirrhosis of the liver, said she understood better how to give her patient, a physician, a low sodium diet. The nurse prior to going on duty with her current patient had for 2 years taken care of cardiovascular disease patients only.

- A hospital dietitian, who is now an instructor in a school of nursing, reported that she had prepared teaching materials centered on the patient with cardiovascular disease rather than on the diet.

- One medical social worker, serving on a national committee, felt she was more helpful in selecting teaching materials for schools of social work. She had been active also in establishing communication between the new medical

social worker in the school of medicine and those in other disciplines.

- One of the health officers said that during the course he had learned for the first time that State health department nutritionists were interested in the problems of special diets for the cardiovascular disease patient and had begun using their services. Recently, he became the assistant to the director of the division of local health services in the Oklahoma Department of Health and now is serving as consultant throughout the State.

In Tulsa a different approach was used. The supervising nurse had shared her course of instruction with the nurses in the district to which she was assigned. These staff nurses reported their experiences to the group. One nurse asked a private physician regarding dietary problems of the patient for whom the physician had requested nursing service in giving a diuretic. At first the physician rejected the idea; later he acknowledged the visiting nurse's contribution by requesting visits to other patients. Nurses in other supervisory districts felt that they too would have benefited by instruction from the supervisor who attended the course session.

This followup evaluation added much to the significance of the course and provided useful information in planning future courses of instruction.

How to Set Up a Heart Course

For schools wishing to offer a heart disease course for multidisciplines similar to the one at the University of Oklahoma, the Heart Disease Control Program of the Public Health Service has prepared the following outline describing step by step the development of the course. This outline may serve as a checklist; however, it is only suggestive since individual situations cannot be anticipated, and its chronology cannot possibly be more than relative.

ASSUMPTIONS

That the course will be held at an established university or college for a minimum period of 2 weeks.
That an approximate number hours of credit in the school will be given, if desired, to those who are eligible.

That a properly representative committee will take the leadership in effecting the course.

That the whole-hearted cooperation of all the necessary participant agencies will be attained.

That the need for, and interest in, the course will have been determined in advance.

ter in addition paid for the maintenance of all department employees who attended. Secretarial help was provided by the heart association, the university, and the health department. Literature, films, slides, and mimeographed materials were provided by the heart association and health department. Classroom and other visual aid equipment was supplied by the medical school.

Instruction was offered in a variety of ways with emphasis placed on student participation and teamwork. Field visits, special conferences, and clinics occupied the morning sessions. After lunch the entire class assembled to hear lectures on subjects dealing with the physiology of the circulatory system, etiological factors and preventive aspects of heart diseases, and recent advances in research on the cardiac disorders. Following the lectures, students met in small groups for discussion and exchange of information about the field experiences in which they participated during the morning period. At a seminar session held the last hour of the day, students had an opportunity to discuss with a panel of appropriate experts a selected phase of the heart disease program.

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Some Epidemiological Aspects of Cervical Cancer

RAYMOND F. KAISER, M.D., and ALEXANDER G. GILLIAM, M.D.

EPIDEMIOLOGY is concerned with study of disease in human populations. In common with other medical sciences, its objective is to determine the factors related to or governing disease occurrence. Unlike other medical sciences, however, its universe of study is the human population or segments of it. Through observations of human experience it attempts to determine the characteristics of those people who develop disease, and of those who escape it. This, in turn, involves the measurement of risk to disease in groups of people with different characteristics.

Epidemiological methods of measuring risk to cancer, and other presumably noninfectious processes, have for the most part been borrowed directly from techniques of proved usefulness in communicable disease study. To a large extent these techniques have been dependent upon the stage of development of other disciplines of medical science. For example, it required relatively simple observations in human experience prior to the birth of the science of bacteriology to demonstrate beyond reasonable doubt that diphtheria was communicable. An understanding of important aspects of its natural history, however, had to await the development of simple and inexpensive laboratory tests which would detect those persons in-

fectured but not sick and would evaluate the relative immunity status of the population.

In cancer, observations in human experience were directly responsible for the beginning of what has developed into an enormous amount and variety of experimental research. The first experimental cancers were produced by painting tar on rabbits' ears, an undertaking prompted by the observation in humans that risk to cancer of the scrotum appeared to be excessive in chimney sweeps. Until the development of the Papanicolaou vaginal cytology test (1, 2), however, laboratory research had provided no tools for the epidemiologist to use in extending our present relatively crude descriptive epidemiology of cancer. While it is true that cervical biopsies were introduced as long ago as 1878 by Ruge and Veit (3), it is, to say the least, impracticable to attempt cervical biopsies on large numbers of apparently well women. Though the Papanicolaou test does not satisfy all of the requirements desired by the epidemiologist, it is the first simple, acceptable laboratory test which can be applied to large numbers of well women and will select for further diagnostic evaluation most of those with cervical cancer.

Before this test could be used effectively in general epidemiological studies, a number of questions had to be answered. Could it be effectively applied in general population groups of apparently well women? What were its limits of specificity and sensitivity in such groups? What were the practical logistical problems?

Dr. Kaiser and Dr. Gilliam are both with the National Cancer Institute, Public Health Service, serving as chief and assistant chief, respectively, of the Field Investigations and Demonstrations Branch.

That all of the requisite resources, both human and material, are available and can be fully utilized.

PRELIMINARY PHASE

Appoint a "heart course" steering committee.

Establish overall objectives.

Select a course coordinator.

Choose nonconflicting dates.

Nominate faculty members and verify their acceptance.

Assign responsibility for media publicity.

See that participating agencies are personally briefed.

Determine number and disciplines of students.

Arrange for classrooms, housing, meals, and transportation, as necessary.

Determine the financing of the course: tuition and registration fees, selective scholarships, and so forth.

INTERMEDIATE PHASE

Determine course content, teaching methods, and format.

Explore clinical facilities available for field experience and observation.

Arrange for selected patients to be observed.

Prepare and mail announcement brochures to predetermined list of prospective students.

Choose and obtain visual aids and equipment.

Check availability of library facilities for reading assignments.

Assemble family and patient summaries from live case material selected from agencies sending students.

Appoint a qualified writer to prepare proceedings of the course for subsequent publication.

Arrange for secretarial and other such assistance.

Prepare detailed schedule of classes, conferences, and observations which permits flexibility in meeting individual needs.

FINAL PHASE

Prepare bibliographies, and select "hand out" literature.

Prepare sheet of suggested problem areas for group work.

Provide guide questions for observations.

Prepare pretests and posttests, based on point 7 in "Intermediate Phase."

Prepare a course "opinionnaire" for students.

Supply applicants with advance reading assignments as desired.

COURSE BEGINNING

Register students and distribute necessary instructional materials.

Divide class into teams, each to include various disciplines.

Permit each team to select a problem to study.

Provide each team with a full-time counsellor, or consultant.

Give students pretest.

Obtain from students written statements of individual objectives in the course.

Follow up on media publicity.

Throughout course allow for group decisions and flexibility indicated by student reactions.

COURSE ENDING

Give posttest.

Distribute "opinionnaire" for completion.

POSTCOURSE

Arrange for on-the-job followup of students to identify tangible results from the course.

Reassemble group for followup evaluation conference if possible.

Make resultant improvements in subsequent courses

riphery of infiltrating lesions (9). The relationship is also inferred because of its demonstrated presence prior to the development of some invasive cancers (9-12), and its detection at an earlier average age than usually observed for invasive cancers at this site (4, 9). The determination of the relationships of the carcinoma-in-situ lesion to classical cervical carcinoma is of paramount importance. To accomplish this, questions primarily epidemiological in nature must be answered.

Some of the more fundamental questions involved in this relationship are:

1. Do all invasive cervical cancers begin as intraepithelial lesions? If not, what percentage do?

2. Do intraepithelial lesions invariably progress to invasiveness? What percentage do?

3. What is the time required for an intraepithelial lesion to progress to invasiveness?

4. Do some intraepithelial lesions regress and disappear? How often does this occur?

5. Is it possible for an intraepithelial lesion to remain noninvasive indefinitely?

6. What are the age-specific incidence and prevalence rates of carcinoma-in-situ and invasive carcinoma? Are there race-specific variations in such rates?

Whether or not all invasive cancers of the cervix pass through the in-situ stage, and whether this intraepithelial lesion is reversible or always progresses to invasiveness, is not known at the present time. Its recognition, however, besides introducing problems regarding treatment (13), has opened new avenues for study of the essential pathogenesis of cervical cancer (14).

A large part of the attention now devoted to intraepithelial lesions of the cervix may be attributed to the extensive use of the cytological technique of Papanicolaou. By means of this test definitive diagnostic procedures may be directed to those women who are considered most likely to harbor invasive cancer (4). In addition, the test leads to the histological diagnosis of many intraepithelial lesions which otherwise would have remained undetected.

Clinically, the onset of carcinoma of the cervix is generally characterized by an absence of alarming symptoms. Those which would lead to its early discovery may give no concern

to the patient during menstrual life. As a result, it frequently progresses into a moderately advanced disease before discovery, and early carcinomas of the cervix (stage I) make up only about 10 percent of the cases seen in many clinics (15). In addition, stage for stage, carcinoma of the cervix carries a much poorer prognosis than cancer of the body of the uterus.

The League of Nations' clinical classification of these cancers, adopted first in 1929 and modified in 1937 and in 1950, divides the disease into five stages. Stage 0 is reserved for carcinoma-in-situ and the remaining four stages are reserved for progressively extensive stages of the invasive disease. Patients treated in stage 0 should respond with uniform cure. According to Heyman (15), survivorship thereafter becomes progressively worse as treatment is instituted in advanced stages of the disease; there is about 60 percent recovery for stage I and 8 percent recovery for stage IV. Results from treatment in different clinics vary considerably, but factors responsible for such variation cannot be fully assessed. It is clearly evident, however, that the stage of disease at the time treatment starts is of paramount importance in cure. This fact emphasizes the necessity for obtaining a full understanding of the quantitative relationship of carcinoma-in-situ to invasive cancer of the cervix.

Extent of Uterine Cancer Problem

With the exception of the single year 1914, deaths in the United States attributed to cancer of the uterus were grouped with cancers of all female genital organs until 1930, when the fourth edition of the International List of Causes of Death came into use. Since then, uterine cancer deaths have been tabulated annually by age and race (16, 17). Analysis of these data shows a consistent decline in the age adjusted death rates for uterine cancer among white women since 1914 and among the non-white since 1930 (unpublished data, A.G.G.).

Death data for cancer of the cervix were first listed separately in 1939, but were not subdivided by age and race until 1949. Such data are of little practical value, however, in assessing the forces of mortality from cervical cancer, since such a high proportion of all

What was the cost in money, equipment, and personnel? Although some of these and other questions have been answered with regard to use of the test as a diagnostic adjunct in clinic and office practice, the only answer to its practicality in general epidemiological study, or as a cancer control measure, lay in an attempt to use it on a communitywide basis. Recognition of this fact led to such a study in Memphis and Shelby County, Tenn. The study was instituted in July 1952 as a joint endeavor of the University of Tennessee, the National Cancer Institute of the Public Health Service, and a host of other individuals and agencies.

Many important facts have already emerged from this study (4). Sufficient preliminary data are now available for examining other facets. It is the intent of this presentation to provide a brief background of the disease itself and some descriptive facts and apparent facts of the epidemiology of cervical cancer.

The Disease Itself

Carcinomas of the uterus may be classed in three groups: epidermoid, or squamous cell, carcinoma of the cervix, endometrial adenocarcinoma of the corpus, and adenocarcinoma of the cervix (5). Epidermoid carcinoma of the cervix and adenocarcinoma of the corpus appear to be quite distinct entities in histological structure, clinical behavior, and selective factors associated with their occurrence. Adenocarcinomas of the cervix are less clearly differentiated from the other two groups because of the difficulty in determining the precise point of origin of some adenocarcinomas of the lower part of the uterus.

The relative frequency of the 3 types of uterine carcinoma varies considerably from one reported series of cases to another, but broadly speaking cervical carcinoma is 3 or 4 times as common as endometrial, and cervical epidermoid carcinoma is at least 10 times as common as cervical adenocarcinoma (5).

At least some, and conceivably a large part, of the differences in relative frequencies of fundal and cervical carcinoma, as reported in different series of cases, is due to the different composition of each series with respect to age, race, marital status, and other selective factors

associated with the occurrence of the two diseases. Most published series do not provide the data on such characteristics, which are necessary to make adequate appraisal of the large differences in recorded relative frequency.

Most epidermoid carcinomas of the cervix arise directly from the stratified epithelium of the external os or the portio vaginalis. Occasionally the origin may be from metaplastic stratified epithelium formed within the cervical canal or glands, or in an endocervical polyp (5). The development of the disease in the cervix is not dependent on the presence of the body of the uterus since it occurs after subtotal hysterectomy performed for other uterine disease. While occasional specimens of early cervical carcinoma afford evidence that the growth has arisen, not from a single minute focus, but from a considerable field of epithelium, no clear instances of genuine multicentric origin have been described (5).

In addition to frankly invasive malignant lesions of the cervix, histological lesions have been described since 1910 which fulfill all criteria of malignancy except invasion (6). As a result of his work with the colposcope, Hinselmann, as quoted by Traut and Benson (7), described in 1924 four classes of lesions of abnormal cervical epithelia from dysplasia through anaplasia, and intraepithelial cancer to invasive cancer. The term carcinoma-in-situ was applied to the most definitive of these patterns of abnormal epithelium in 1932 (8). Since then, this lesion has been variously labeled surface carcinoma, intraepithelial carcinoma, intramucosal cancer, and carcinoma-in-situ. It is now generally agreed that it may be preinvasive cervical cancer or an early stage of cervical carcinoma. However, there is considerable controversy as to the significance of other epithelial changes, such as dysplasia, hyperplasia, and anaplasia, and their possible relationship to invasive carcinoma.

Since 1932, much literature has appeared concerning the minimum histological criteria necessary for diagnosis of carcinoma-in-situ, as has data on its frequency, incidence, and its significance. Its relation to invasive cancer is inferred because of its histological appearance (6) and, according to Schottlaender and Kermanner, because of its occurrence at the pe-

in either Denmark or Memphis (20). These regional differences in age selection are sufficiently great to warrant the suspicion that they are not artifacts, but no ready explanation is available for them. Further, in each locality, fairly distinct differences exist between the age selection of cancer of the cervix and of cancer of the body of the uterus. The consistently different age selection of cancer in the two parts of the uterus is one reason for suspecting that they represent two disease entities.

Race Selection

With the exception of limited morbidity data, and fairly extensive mortality figures for the white and nonwhite population of the United States, most of the evidence of racial selection of cervical cancer is derived from relative frequency data. Relative frequencies on some occasions faithfully reflect absolute variations in risk, but on other occasions they do not. In any case, there is probably no other type of cancer in which racial selectivity of the disease, as suggested by relative frequency evidence, offers such intriguing possibilities of better understanding its genesis.

On the basis of relative frequency figures, Williams claimed in 1900 that American Negroes were less prone to uterine cancer than white women (21). That the reverse is true is now amply demonstrated not only by mortality figures for a long period of time but by morbidity rates collected in special surveys (28, 29). Many doubt that the clearly excessive risk among the nonwhite women in the United States is due to actual racial susceptibility. Most workers contend that it is due instead to a number of factors which have been loosely classed as social or environmental (30, 31).

While the early relative frequency evidence for the white and the nonwhite women in the United States was not substantiated, evidence of a similar basic nature relating to Jewesses has been established as correctly portraying relative risk (30). There appears to be no longer any doubt that Jewesses experience substantially less risk to cancer of the cervix than the non-Jewish (32, 33, 35). A recent study in Israel has elicited very low incidence rates, and since Jewesses of different "ethnic typology"

experience rates of about the same magnitude, the authors believe that it cannot be dependent on a racial factor, but is due instead to circumcision of Jewish males (35).

Except for absolute comparisons of risk relating to the white and the nonwhite population in the United States and Jewesses in Israel, most of the other evidence of racial selection involves relative frequency data. For example, Khanolkar's study relating to various classes of Indians attending the Tata Memorial Hospital in Bombay supports the idea that Hindu Decanni and Gujarti, and Moslem women, all experience a different risk to cancer of the cervix (36). Since, however, the evidence consists of relative frequencies, not incidence, it does not establish these differences.

Mortality statistics from different countries cannot be easily compared because of the different proportions of deaths in each country which are unspecified as to portion of uterus affected. For cancer of the uterus as a whole, however, the age adjusted death rate in 1950 in Japan was more than twice that recorded in England and Wales; about 40 percent greater than the rate among white American women; and about 40 percent less than that recorded among American nonwhite women (37).

Among the American Navajos, if relative frequency comparisons are accepted as evidence, risk of death from all uterine cancer would be twice that observed in American whites and about the same as noted in nonwhites as a whole. Adequate comparisons of absolute risk show, to the contrary however, that the risk for the Navajo is only half that observed for the whites and only a fourth of that noted for the nonwhites (38).

Geographic Distribution

Data on geographic distribution of cervical cancer consist of official mortality statistics, the results of summations of autopsy series, and morbidity surveys conducted in a few localities. While the data from only the latter are reliable as to the absolute probability of developing the disease, official mortality statistics and autopsy studies clearly show that cancer of the cervix has been recorded on every continent, in every large country, and among every important ra-

uterine cancer deaths are unspecified as to the portion of the uterus affected. In 1949, 43 percent and in 1955, 34 percent of all uterine cancer deaths were unspecified as to origin in the uterus. It is therefore not possible to determine whether or not cancer of the cervix and cancer of the corpus have participated equally in the decline in mortality attributed to cancer of the uterus as a whole.

During 1955, 15,170 deaths were attributed to cancer of the uterus in the United States (17). Among white women the crude death rate was 17.0 per 100,000 population. This rate was exceeded by only those for cancer of the breast (27.2 per 100,000) and cancer of the large intestine (17.5 per 100,000). Among non-white women more deaths were attributed to cancer of the uterus than to any other type of cancer, the crude death rate being 28.7 per 100,000 population. For both races combined, deaths from cancer of the uterus were exceeded by only cancer of the breast. According to unpublished data (A.G.G.), on the basis of rates for deaths from all causes recorded in 1955, 1.8 percent of white and 3.0 percent of nonwhite women would be expected to die eventually of cancer of the uterus.

Of those deaths for which the part of the uterus first affected was recorded on the death certificate, there were, in 1955, 17 times as many cervical as corpus cancer deaths among the non-white and 7 times more cervical cancers among the white. As pointed out, however, there was a substantial number of deaths among both races with unspecified origin of the disease in the uterus. In the unlikely event that all of those unspecified had arisen in the corpus, deaths due to cancers of the cervix would still predominate in both races, and the cervix-corpus ratio would still be greater in the non-white than in the white.

During this period of decline in mortality, the incidence of the disease has been increasing in at least one State. In New York, between 1942 and 1953, the cervical cancer incidence rate increased 7 percent, and cancer of the corpus, 21 percent (18). In Connecticut, on the other hand, the incidence of cervical cancer decreased 8 percent while corpus cancer increased 22 percent between 1935 and 1951 (19).

Based on reports from New York State, during 1949-1951, the lifetime probability of developing cervical cancer was 2.2 per 100 women, and cancer of the corpus, 1.5 per 100 women, or a total of 3.7 per 100 women for all uterine cancer (20).

Age Selection

The tendency of cancer of the cervix to occur earlier in life than cancer of the body of the uterus was well known at least as early as 1900. In Williams' series the maximum frequency was in the age group 35 to 45, as compared with the mode in the age group 50 to 60 for cancer of the corpus (21). While cases in persons under 20 years of age are uncommon, a few histologically diagnosed cases have been described in such persons (22-24), the youngest being an infant of 7 months with a cervical adenocarcinoma (25). In 1955, out of 8,504 deaths attributed to cancer of the cervix in the United States, 3 were under 5 years of age and 5 under 20.

Perhaps the most reliable data on age incidence of the disease are those from Denmark and Sweden. These data reflect the annual probability that women of various ages will develop or be diagnosed as having the disease. In Denmark, for the years 1942-44, the incidence rates for cancer of the cervix rose sharply from age 25 to a peak of about 70 per 100,000 in the age group 45-49, and declined fairly regularly thereafter (26). In Sweden a similar age selection is evident though the rates, age for age, are lower than observed in Denmark, and the peak of incidence occurs about 5 years later in life (27). The Swedish data also show a regular increase in incidence at all ages between the calendar years 1925 and 1945, an increase more marked than that observed in New York State.

In contrast with the type of age selection prevalent in Denmark and in Sweden, risk of the disease in Connecticut increases fairly regularly with age, and instead of declining after 45 or 50 continues to increase, reaching a peak in women 85 and over (19). A similar type of age curve is observed among white women in Shelby County, Tenn., but not among the non-white (28). In New York State the age selection is somewhat different from that observed

observed between breast and cervical cancer patients in any 1 of the 3 localities.

It appears clear from the brief considerations mentioned that the role of these various factors associated with cervical cancer still remains to be clarified with additional and perhaps different kinds of systematically collected data.

Socioeconomic Status

It has been common experience of gynecologists that cancer of the cervix is less frequently encountered in private than in clinic practice. Mortality data for 1930-32 for Great Britain similarly indicated that risk of dying from uterine cancer as a whole increased with the decrease in socioeconomic status (53). That this is largely due to cancer of the cervix is now evident from analysis of similar death data for 1950 and 1951 (46). These show that when socioeconomic class is judged by occupations of husbands, the rates were lowest in women whose husbands were in the professional class and highest in wives of unskilled laborers, with a fairly regular gradient in the intermediate classes. Stocks concludes from these and other analyses of regional variation in mortality that the disease in Great Britain shows a relationship with overcrowded housing, social class distribution, and predominant industry 20 years before (46).

Infections and Cervical Lacerations

For a considerable period of time, chronic cervical infections and poor obstetrical care were believed to predispose a woman to carcinoma of the cervix. The idea that cervicitis or cervical lacerations might be the cause of this cancer is probably an outgrowth of the general theory of chronic irritation as the cause of all cancer. There appears to be little definitive evidence bearing directly on it one way or the other, however. From the histological standpoint, early cancers at this site are observed with no associated evidence of chronic irritation. Evidence of cervical lacerations, on the other hand, is common in parous women.

Gagnon is of the opinion that the rarity of the disease in nuns is due to the infrequency of cervicitis in this group (51). Cashman has

noted that fewer cervical cancers than expected occurred in about 5,000 women who could be followed out of 10,000 women whose cervicitis had been treated by deep cauterization (54). If, however, there had been a very few cases among those women who were not followed, the results might have been quite different.

With regard to cervical lacerations, Lombard and Potter's case history study indicated an association between history of lacerations and this cancer (47). Gilliam's series, on the other hand, at least indicated no undue proportion of instrumental deliveries among cervical cancer patients (48). Since both studies depended upon histories as remembered by patients and controls, it is not certain that they correctly portray the actual facts. As for other evidence based on clinical impressions, there is still considerable difference of opinion among gynecologists as to the possible association of these factors and the disease. That even repeated trauma, and by inference cervicitis, is not necessarily involved is suggested by the apparent rarity of the disease in cases of prolapsed uterus (55).

Discussion

It should be clear from this brief account of some of the facts of distribution of cervical cancer among humans that many selective factors bearing on its occurrence have been recognized. There is a common, and perhaps unfortunate, tendency among students of cancer, however, to assign specific causal significance to such factors, often even before the facts themselves are well established. Thus, when it appears that cervical cancer is more common in parous than in nulliparous women, the statement soon after appears in texts, as though it were fact, that the disease is caused by cervical lacerations. When it is evident that Jewesses are less prone than the non-Jewish—then *ergo*, it is caused by intercourse with the uncircumcized. Or, when it appears there is a tendency to select women who marry early in life—it is caused by trauma of immature tissues. Or, when it is shown that risk is greater in syphilitics than in nonsyphilitics—it is caused by chronic irritation. Or, because it selects the lower rather than the higher economic classes,

cial and ethnic group. Furthermore, the frequency of cancer of the cervix relative to all other cancer, as observed in the autopsy series, varies considerably from place to place. Whether or not risk of the disease varies in the same fashion cannot be determined from most such studies.

Within some countries for which pertinent data are available, incidence of the disease varies considerably. In Denmark the highest rates are observed in Copenhagen, and the lowest among the rural population (39). This excess risk among urban women also appears to exist in the State of Iowa (40). White women in southern cities of the United States appear to experience greater risk than do the northern white women (29), and in Copenhagen (41) and Pittsburgh (42) there is considerable variation in rates within the city. In these latter cities the higher rates are found in the poorer sections.

Marital and Pregnancy Status

The first clear evidence that cancer of the uterus and cancer of the breast tend to have an opposite selectivity with respect to marital status was presented apparently by Rigoni Stern in 1842. While only 6 percent of the uterine cancer deaths recorded in Verona, 1769 to 1839, were in unmarried women, 29 percent of the breast cancer patients were unmarried (43). These differences are the more striking in view of the fact that cancer of the uterus generally occurs at an earlier age when the probability of marriage is less than in later life. These data did not permit the firm conclusion that uterine cancer is more likely to occur among married women than among single, but they did demonstrate the striking difference from breast cancer in terms of selectivity according to marital status.

It has now been established that the annual probability of developing cancer of the cervix is greater in married than in single women (39, 44-46). It would further appear that early age at marriage and instability of marriage are also associated with this disease (47, 48). In addition, there is some reason for believing that other variables associated with instability of marriage are also associated with cancer of

the cervix. Thus, there is scattered evidence that illegitimate births (48), syphilis (29), early sexual relations, multiple sexual partners (31), and prostitution (50) are all associated with this disease. On the opposite side of the coin, cervical cancer appears to occur very rarely among nuns (51).

Another variable associated with marriage, which has been given much consideration, is circumcision of the marital partner. This was due first to the observation that cancer of the cervix is less frequent among Jews, where circumcision is universal. Other races which practice circumcision at varying ages and to a different extent are alleged to have varying risk of cervical cancer. The so-called incidence reported for such races, however, is invariably a relative frequency which may or may not reflect relative risk to this cancer. Reliable data on the incidence of cervical cancer are very badly needed among such groups as the Moslems, Hindus, Bantus, and Fijis. Such rates can now be reliably and relatively inexpensively ascertained through discriminative use of the vaginal cytological technique.

Another variable which has long been associated with cervical cancer is pregnancy. Lane-Claypon's (52) data indicated an association between pregnancy, but not number of pregnancies, and cancer of the cervix. Malphrant's series (44) suggested the greatest risk in parous women, with each pregnancy adding slightly to the risk; the next greatest risk among childless married women; and a considerably reduced risk among single women. Logan's analysis of British mortality data suggested that marital status alone, apart from childbearing, seemed to be the factor associated with higher mortality (45). In Gilliam's series where a precise actuarial method was used in computing age specific pregnancy rates in several types of cancer patients, the difference in fertility between those with breast cancer and those with cervical cancer was limited to the first 30 years of life (48). After age 30, pregnancy rates in breast and cervical cancer patients were identical. A further curious finding in this series was the greater difference in pregnancy rates between the cervical cancer patients interviewed in 2 of the cities than was

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it is caused by poor hygiene and inadequate general medical care.

All of these factors associated with cervical cancer may well eventually turn out to be causes. On the other hand, an equally tenable hypothesis at the present time is that the disease is caused by some presently unknown factor or patient attribute which is more commonly present in women with these characteristics, but is by no means limited to them. The fact remains that the disease does occur in virgins, in nullipara, in Jewesses, in the non-syphilitic, and in women of the highest economic classes, to mention only a few of the selective factors. Demonstration of excessive risk in women with certain characteristics does justify a hypothesis. No useful purpose is served, however, by parading hypotheses as fact, a tendency all too commonly encountered among students of cancer in general.

Up to the present we are aware of no weaving together into a coherent and generally satisfying explanation of the disease the threads of facts regarding distribution of cervical cancer in humans. The development of the Papanicolaou test, however, provides a laboratory tool which, if properly exploited epidemiologically, can at least test and either dispose of or extend some hypotheses which have been paraded as fact.

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animals and insects in man's environment, dogs, cats, rodents, flies, ticks, snakes, and tortoises have been incriminated as vectors of salmonellosis. *Salmonellae* have also been isolated from fish and shellfish, and the evidence indicates that these species encountered the organisms in water contaminated by man or other non-aquatic animals.

Since *Salmonella* types are widely distributed through the animal kingdom, there is small wonder that the organisms are frequently present in animal food products. Recent investigations have revealed their presence in an unexpectedly high percentage of meat and animal products, and this has resulted in a further investigation of the roles that food processing and human carriers have in salmonellosis. Carcasses in abattoirs have been shown to contain organisms more often than animals on farms, indicating that the abattoir environment and processing procedures favor the spread of the organisms. Investigators have also found salmonellae widely distributed in poultry-processing plants.

Although outbreaks in which human carriers were responsible for the contamination of meat products have been frequently described, the ultimate source is in no way certain since it might be said that the carrier state is an occupational hazard of those who continually handle uncooked meats and carcasses. Direct transmission may also occur from man to man without the intervention of food.

Means for control of the incidence and transmission of salmonellosis are slowly getting under way.

While there is a large reservoir of salmonellae in the lower animals, this situation can be expected to improve gradually. Tests for the detection of the infections and methods of eradication are being studied in fowl and cattle. Progress has been made in the eradication of salmonellae from poultry flocks through agglutination testing programs for *Salmonella typhimurium*. Possibilities of detecting *S. dublin* infection by agglutination tests have also been studied. Although the elimination of salmonellosis from flocks and herds cannot be accomplished in the immediate future, it is encouraging that animal pathologists are thinking of eradicating the infections rather than

controlling them. It must be admitted, however, that this attitude is directed largely by economic considerations rather than by regard for public health.

In any effort to eradicate salmonellae from domestic animals it is necessary to take into consideration the continuous seeding of the population through infected feed, and such sources must be eliminated if *Salmonella* infections are to be eradicated from flocks and herds.

With regard to dissemination from person to person, every effort should be made to prevent the spread of organisms among the population by means of the excreta of patients, convalescents, and carriers. This is a joint responsibility of the practicing physician, the health officer, and the laboratory. Prompt isolation of patients with symptoms of intestinal infections and proper disinfection of the dejecta must be carried out until such time as a definite diagnosis is established. Contacts should be examined bacteriologically, and the strictest personal hygiene should be practiced in the household. Convalescents should be examined systematically until the bacteria no longer can be isolated from the excreta.

Stool cultures should be required from all food handlers, not only those in food dispensing establishments but those in food processing plants as well. In addition, hygienic conditions in these plants and establishments must be improved. It has been demonstrated that thorough and consistent cleansing of abattoirs and equipment results in a marked reduction in the recovery of salmonellae from carcasses and from the environment.

Researchers have suggested that bacteriological standards for the control of abattoir and food processing establishments would be helpful; that an approach similar to that employed in dairy products should be applied to other products of animal origin including fish and poultry; and that, in time, coliform organisms as an index to pollution may be successfully adopted for the bacteriological environment of meat processing plants as it has been adopted successfully in dairy products and shellfish.

Food technology has made giant strides within recent years, especially in the removal of food preparation from the family kitchen to

Animal Diseases and Human Health

On September 11–13, 1957, a Conference on Animal Diseases and Human Health was held in New York City under the joint auspices of the New York Academy of Sciences and the Public Health Service's Communicable Disease Center.

The significance of these diseases was discussed from two viewpoints: the direct transfer of disease by parasites or by consumption of diseased meat and milk, and the reduction of food supplies caused by outbreaks of animal disease.

Enzootic, epizootic, and zoonotic diseases were considered, along with means by which the diseases are transmitted. Some were examined because they present particular economic and public health threats; others because the study of animal diseases may enlighten students of human afflictions.

The conference discussions are represented here in summaries of 16 of the papers. The full proceedings are to be published by the New York Academy of Sciences.

Salmonellosis: Incidence and Control

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It is impossible to determine the incidence of salmonellosis in either man or animals. No systematic method of reporting salmonellosis of animals has been established, and one must rely on summaries of isolation and identification of causative agents dispersed throughout the medical and veterinary literature to estimate the frequency with which the bacteria occur among the lower animals.

Means of determining the incidence of the disease in man are practically in the same condition. Summaries published by the National Office of Vital Statistics are based on woefully inadequate reporting from a minority of States, and in most instances the etiological agents of foodborne infections are not accurately determined. Despite these deficiencies, one must rely

upon these summaries for any estimate of the prevalence of *Salmonella* infections in the United States.

Despite methodological inadequacies with regard to incidence, the list of occurrences indicates that there is a direct correlation between salmonellosis of animals and man in any given locality, although the methods whereby the organisms are transmitted from animals to man and vice versa may vary from one region to another, depending upon sanitary facilities and habits of the population.

Numerous *Salmonella* serotypes have been isolated from animals used as food by man and from animals with which man comes into close contact. Not only have host-adapted types such as *Salmonella dublin* in cattle and *Salmonella choleraesuis* in swine been found frequently, but large numbers of types not adapted to specific hosts occur among domestic animals. While salmonellae are particularly numerous in swine, birds probably constitute the largest single reservoir in animals. The organisms have been isolated from turkeys, poultry, wild game, and egg products. Among the nonedible

indicate that transmission can be effected by inoculation of sheep with sterile centrifuged extracts of infected and frozen sheep lung. Although 1 to 3 years are usually required from the time of inoculation until symptoms appear, the disease develops progressively. Sheep sacrificed periodically after inoculation show pathological changes at least several months before symptoms are expected to appear.

Apparently pulmonary adenomatosis in sheep was entirely enzootic until early in the present century when epizootic disease appeared, inviting recognition of its contagious nature. Forms of pulmonary adenomatosis of similar histology and clinical course also occur in man. Whether etiological similarities obtain is an unanswered question at present. Information gained from the study of contagious animal neoplasm, however, may be useful as a guide to the future study of neoplasia in man.

Cat Scratch Disease

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The specific entity known as cat scratch disease, cat-bite fever, benign inoculation lymphoreticulosis, nonbacterial regional lymphadenitis, and so on, has been recognized as a common human disease only during the past decade. Actually, the condition was recognized as early as 1930 by Foshay in Cincinnati, Ohio, but published detailed descriptions did not appear until 1950.

Most cases of cat scratch disease follow scratches or bites by domestic cats. But other sources have also been recognized, including thorns, cat urine, and bone spicules. No definite clinical disease in the offending animals has been discovered.

Lymphadenopathy is the most characteristic lesion of cat scratch disease. Usually the nodes draining the area of the primary lesion are involved, but extension to other parts of the body may also occur. Thus the axillary and epitrochlear nodes are most commonly involved in scratches or bites on the hand and forearm, the inguinal nodes with lower limb

lesions, and submandibular, suprascapular and cervical nodes following scratches about the face, neck, and chest.

In addition to the typical picture of regional lymphadenopathy, syndromes involving bone, central nervous system, eyes, and the spleen have been observed.

Geographically, the disease is widespread, having been reported in Europe, Great Britain, North and South America, and Asia. Undoubtedly many cases occur that are as yet unrecognized.

The causal agent has never been identified. It has been presumed that an agent similar to those of the psittacosis-lymphogranuloma venereum group is responsible, but recent information does not tend to confirm this presumption.

Extensive microbiological and pathological studies have been done and, although no proven etiological agent has been discovered, characteristic histological lesions have been described. There is no specific skin test that is quite accurate in diagnosis.

There are no public health methods presently applied for the control or treatment of this disease. As the association of man with domestic pets continues, increasing numbers of clinical cases are likely.

The Pan American Zoonoses Center

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The Pan American Zoonoses Center is an international institution dedicated to promoting and strengthening activities against the zoonoses in the Americas. Its services are available to health departments, agriculture departments, educational institutions, and other agencies interested in the zoonoses: those diseases naturally transmitted between animals and man.

The center, which has its central site in Azul, Province of Buenos Aires, Argentina, was established in August 1957. The Pan American Sanitary Bureau is the sponsoring international organization, although provisions have been made for other international agencies to

the large establishment. It seems in many instances that methods of control and measures for their enforcement have not kept pace with advances in food processing. More rigid control of products becomes even more important and practical when it is remembered that salmonellae may survive temperatures to which food products are sometimes subjected in cooking. Since it is possible to pasteurize certain food products effectively or to destroy salmonellae in them through a combination of acidification and mild heating, it would not seem unreasonable to adopt and enforce bacteriological standards for such products. New processes of food preparation and storage require new and improved procedures and practices to deal with them.

All of the writers who have given serious thought to the control of salmonellosis agree that effective control can result only through the cooperation of governmental agencies dealing with health, agriculture, and food. Further, it is agreed that salmonellosis should be a reportable disease of both man and animals, and that effective reporting and control measures should be enforced.

Through cooperation of physicians, health officers, veterinarians, and sanitarians with the proper governmental agencies, and through education of the public in the fundamental sanitary aspects of the preparation and preservation of foods, control of the infections may be expedited.

Newcastle Disease

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Newcastle disease is a minor occupational disease limited chiefly to persons working with chickens and eggs and to those concerned with control of the disease. The population at risk is rather sizable since poultry is raised on approximately 3,418,000 farms in the United States.

In all known instances, infection of man has been limited to the initial case, the transmission

being from bird to man and never from man to man. Acute conjunctivitis is the usual manifestation, although systemic disease has been reported. Initial diagnosis of Newcastle disease in man is dependent mainly upon isolation of the virus, for the serology is complicated by certain problems of interpretation.

The importance of Newcastle disease lies in the resulting higher-priced poultry products and a reduction in their quality. The disease may kill, but more often it affects the poultry by interrupting growth and egg production, and it increases the percent of birds and eggs rejected for abnormalities.

While vaccination has permitted profitable production of poultry, it has not eliminated the virus in any part of the Nation, and it has not reduced the hazard of human infection. An organized control and eradication program is lacking, and without one the virus is afforded infinite opportunity to give rise to a mutant capable of maintaining itself in the human population.

Pulmonary Adenomatosis in Sheep

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Workers in various parts of the world have described several invariably fatal pulmonary diseases of sheep that can probably be grouped together into a complex of related entities.

Histologically, these diseases can be arranged in a spectrum, with pure infiltrative pneumonia or pulmonary lymphomatosis at one end, and metastasizing adenocarcinoma at the other. All degrees and combinations of inflammatory neoplastic disease occur between the two extremes, some forms being histologically indistinguishable from human pulmonary adenoma.

Representatives of all forms are naturally contagious, including the metastasizing adenocarcinoma of Peru, and there is considerable evidence that all forms in sheep are naturally transmissible. Experiments now under way with an infiltrative form occurring in Montana

tendency, renal, hepatic, and vascular failure, and a high fatality rate. Symptoms persist from 1 to 3 weeks. Leptospiremia and leptospiruria occur at various stages and antibodies are demonstrable in convalescence.

The currently recognized human American species of *Leptospira* are *icterohemorrhagiae*, *canicola*, *pomona*, *bataviae*, and *autumnalis*.

Milder forms of illness result usually from infection by leptospirae other than *L. icterohemorrhagiae* and *L. bataviae*. Over 200 patients with leptospirosis contracted in a tropical environment had fevers enduring from 4 to 20 days, with an average of 8 days. Studies conducted in Malaya from 1954 to 1955 revealed leptospiral infections to be a significant cause of short-term pyrexia. Only two fatalities occurred among these patients and few presented overt clinical evidence of hepatic, renal, or cardiovascular insufficiency.

Clinical features may resemble aseptic meningitis. A leptospiral etiology should be considered in any illness characterized by fever, myalgia, nausea or vomiting, conjunctival injection, proteinuria and neutrophilia.

Rheumatoid Arthritis in Man and Arthritis in Swine

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Arthritis in swine is prevalent under farm conditions. In some cases, an infectious agent can be isolated; in others, none can be found. Pyogenic bacterial infections produce enlarged, soft joints distended with pus. This purulent type of infection occurs most frequently at the time of birth, probably through the umbilicus.

In *Erysipelothrix rhusiopathiae* infections, the organism may disappear from the joints while the arthritis persists. In such cases many macroscopic and microscopic pathological changes similar to rheumatoid arthritis in man are present.

In acute arthritis there is synovitis, characterized by vascular engorgement, and edema of the synovial tissues. The effusion is turbid or serosanguineous and mucinous. The synovial

villi show evidences of beginning proliferation and beginning lymphocytic infiltration. Later, greater proliferation and less edema are observed. Proliferation of the mesothelial cells covering the hypertrophied synovial villi is present. The villi contain young, highly vascular connective tissue, plasma cells, and lymphocytes. A striking feature is the accumulation of dense collections of lymphoid cells resembling germinal centers of lymphoid tissue.

In advanced chronic arthritis with pannus formation of subchondral origin, fibrosis in the adjacent narrow spaces, increased vascularity, and collections of lymphocytes occur. Pannus formation over the articular cartilage with or without fibrous ankylosis, narrowing of the joint spaces with rarefaction of the adjacent bones, and greatly thickened capsules are evident.

A comparison of arthritis of swine and rheumatoid arthritis of man shows some similarities. In both diseases, the changes are essentially proliferative and nonsuppurative and have a tendency toward granulomatous proliferation in the synovial membrane. Pannus formation and focal accumulations of lymphocytes are observed. Destruction of cartilage at the site of pannus attachment and subchondral cellular reactions appear similar. Rarefaction of the bone as revealed by radiography and intra-articular fibrous adhesions are common to both diseases.

Listeriosis: A Public Health Problem

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Listeriosis is a little known, infrequently recognized, but widespread bacterial disease of man and other warm-blooded creatures. The causative agent, *Listeria monocytogenes*, has been recovered from man, mammals, and birds in a number of countries all over the world, and in 22 of the 48 States.

Morphologically, the organism is a gram positive, non-acid-fast, non-spore-forming rod.



Main building of the Pan American Zoonoses Center in Azul, Province of Buenos Aires, Argentina. The only international institution of its kind, the center is primarily devoted to research on diseases communicated from animals to man. The center was

established in August 1957 as a result of a special agreement the previous year between the government of Argentina and the Pan American Sanitary Bureau, Regional Office for the Americas of the World Health Organization.

join forces with the Bureau. Provisions have also been made for direct support of the center through contributions from any country.

The center is designed to educate and train professional and paraprofessional personnel in techniques and methods to combat the zoonoses. It will also (a) conduct research to improve diagnosis, epizootiological-epidemiological knowledge, and control procedures; (b) promote, aid, and coordinate such research in government and private institutions; (c) work toward the standardization of diagnostic methods for making and testing vaccines, serums, antigens, and other biological products; (d) prepare and disseminate information on the zoonotic diseases; and (e) develop field demonstration activities in accordance with the needs of participating countries.

Promoting and strengthening governmental activities against the zoonoses in the Americas is the principal function of the center. But this objective can be reached only insofar as there are sound technical activities and services

in each country dedicated to research, control, and eradication of diseases common to man and animals.

While there are over 80 zoonoses, the center will give priority to those of major importance in the Americas: rabies, brucellosis, hydatidosis, tuberculosis, encephalitis, salmonellosis, psittacosis, and anthrax.

Leptospirosis in Man

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Human leptospiral infections comprise a multiplicity of separate syndromes whose clinical features vary from mild grippelike illnesses to those simulating fulminant hepatitis or "aseptic meningitis." The classical disease, described by Weil in 1886, is caused by *Leptospira icterohemorrhagiae* and is recognized clinically by the development of fever, icterus, conjunctival injection, myalgia, hemorrhagic

infections, tularemia, and the viral encephalitis, to name but a few, dominate any such list? They certainly possess some of the characteristics considered in a good biological warfare agent such as high infectivity and stability.

Second is the field of antianimal agents. The widespread outbreak of such foreign animal diseases as foot-and-mouth disease, African swine fever, rinderpest, and Newcastle disease in our domestic animals, to mention but a few, could result in a drastic, if not complete, reduction of available food supplies. This would be particularly true if coupled with a successful destruction of crops.

Third, and perhaps the only silver lining in the defense picture, is the far-reaching benefits human health has received as a result of research in animal disease. Advances in epidemiology, bacteriology, and immunology, for example, are already actively utilized in advancing the health of the Nation.

Orphan Viruses of Man and Animal

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Refinement of tissue culture methods and expansion of their use into the field of virology has brought into focus large numbers of viruses heretofore unrecognized. It is well known that families of viruses, such as herpes and pox, exist in different species, and now it appears that there are also enteric viruses for a number of different animal species. These are enteric cytopathogenic orphan viruses for humans (ECHO), monkeys (ECMO), bovines (ECBO), and swine (ECSO).

ECHO viruses, of which there are at least 19 antigenic types, have been isolated from normal children and from patients with aseptic meningitis syndrome. Because the human diseases to which they belonged were unknown, and because they failed to produce illness in laboratory animals, including infant mice, they were originally called "orphan viruses."

The difference in colony (plaque) morphology and in host cell susceptibility have sug-

gested that the ECHO viruses may be divided into two groups. The selection of the proper serum for antigenic identification has been made easier by such a preliminary grouping.

ECMO viruses are included among the simian viruses of Hull and his colleagues. They may be divided into three groups according to their plaque morphology and patas cell susceptibility. Positive CF reactions were obtained between strains of one group of ECMO viruses and human serum known to contain adenovirus antibodies.

ECBO viruses isolated by Kumin and by Klein grow readily in bovine kidney cultures; some have been found to propagate in monkey kidney cells, but not in HeLa cultures. Those tested have proved to be antigenically distinct from human viruses.

ECSO viruses were isolated from newborn pigs by Moscovici in Italy. The virus grew rapidly in monkey and swine kidney cells, but HeLa cells failed to respond.

In view of this study it is believed that colony morphology and cell susceptibility, classical criteria for classification of enteric bacteria, are of similar value for identification of orphan viruses isolated from man and animal.

Viral Hepatitis in Animals and Man

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Viral hepatitis has been described in man and other animals, including dogs, pigs, mice, and ducks. Such viral agents appear to be characteristically narrow in their host susceptibility. Since for laboratory investigations the viral hepatitis agents of man are not transmissible to other animal species and are difficult to evaluate in tissue culture, mouse hepatitis virus has been studied as a possible prototype of the human equivalent.

Mouse hepatitis virus in embryonated chicken eggs induces changes resembling the effect of acute serum from viral hepatitis of man. Inoculums containing virus induce an

There is a tendency for the organisms to arrange themselves into "V's" or into a palisade formation when the smear is made from solid media. The bacteria stain evenly and are 0.5 to 0.6 by 1.0 to 2.0 microns in size. Short, but sometimes long, threadlike chains may be observed in the rough phase of growth. Capsules are not demonstrable. Motility can be demonstrated in 6-hour glucose broth cultures, but it is more pronounced at 25° C. after 24 hours incubation. The peritrichously flagellated organisms have a characteristic tumbling motion.

Listeria frequently fails to grow when cultured from fresh tissues, but it has been found that refrigeration of the original necropsy specimens and periodic subculturing will increase the number of isolations obtained. There are four serotypes of *Listeria*, and among these are several biotypes. All serotypes and biotypes can and do attack man, poultry, and mammals.

The specificity of agglutinating titers is open to question since some serums spontaneously agglutinate antigen, and *Listeria* shares antigens with other bacteria. This being the case, agglutination titers should be interpreted with caution and preferably compared with the complement fixation test.

Listeriosis in sheep and cattle usually is readily recognized, and the etiological agent is frequently recovered without difficulty. The main clinical manifestations caused by *Listeria* in ruminants, swine, and man are meningoencephalitis, septicemia, and abortion. In animal infections, there is a definite seasonal distribution. The greatest number of animal cases occur during the winter and spring months. This does not appear to be true of human infections. Sex and age distribution in both animals and man appear to show little differences in the incidence of infection, but the younger the creature, the more unfavorable the prognosis.

Therapeutic agents have been evaluated in animals and man, and the tetracycline group have been found to be the most effective; penicillin and sulfonamides in combination proved almost as effective. The in vitro sensitivity gives some indication of the agent of choice. Vaccination of animals has been attempted, but

the trials have not been wholly successful. Further tests, however, should be made.

Since 1950 there have been 83 human cases in the United States verified by the Communicable Disease Center's laboratories, and since 1954 there have been 2,106 animal cases (representing herd and individual cases). We may conclude, therefore, that listeriosis is a public health problem, especially since we do not know the frequency of occurrence nor do we understand the epidemiology of the disease. We do know that it is widespread, that it occurs in humans and animals, and that it is frequently fatal. We also know that the premature infant and the aborted fetus may be due to congenitally acquired *Listeria* which does not manifest itself in an overt illness of the mother, that all ages and both sexes are susceptible, and that animal contact is not necessarily a factor in the epidemiology of listeriosis.

Animal Disease and Biological Warfare

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Biological warfare may be defined as the intentional use of living micro-organisms or their toxic products for the purpose of reducing the military effectiveness of man. This use includes damage to or destruction of his food sources.

Do we have reason to concern ourselves with defense against such warfare? History answers in the affirmative. From the earliest to most modern times it tells us that nations at war will and have used every known weapon system that offers them a possibility of achieving victory.

What is the relationship of animal disease to defense against biological warfare? A brief exploration of three major facets of a biological warfare defense program reveals a close and vital relationship.

First is the field of potential antihuman agents. Would not the zoonoses, animal diseases transmissible to man, such as mycotic

11.5 to 1.8 percent of the animals checked. A similar reduction has occurred in the number of herds carrying the infection. For fiscal year 1955, infected animals were found in 36.2 percent of the blood-tested herds. As of June 30, 1957, this figure was 10.5 percent.

In October 1954 the bovine brucellosis eradication campaign was accelerated by additional Federal funds, and progress during the past 3 years exceeded that reported for any similar period since the program's inception. At present approximately half of all cattle in the United States are under supervision for the control and eradication of brucellosis.

The initial goal of the eradication campaign is to establish and maintain certified brucellosis-free areas. This designation signifies that the infection appears in no more than 1 percent of the animals and 5 percent of the herds. At the end of fiscal year 1957, 735 counties and 7 entire States were certified. Another 712 counties were actively working on programs leading to certification. This means that nearly 50 percent of all counties in the United States, Puerto Rico, and the Virgin Islands are either certified or are rapidly approaching that status. It is estimated that by June 30, 1958, a total of 16 States will be certified.

If the present level of field operations can be maintained, there is every reason to believe that the incidence of bovine brucellosis throughout the United States can be reduced to 1 percent or less by 1960.

Brucellosis in Man

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With more widespread pasteurization of milk and other dairy products, brucellosis in the United States has become almost entirely an occupational disease affecting persons intimately exposed to infected animals or their tissues. In the last 10 years the number of cases reported annually has dropped considerably; nevertheless, if one excepts salmonellosis deriving from animal sources, brucellosis in the

United States still has a higher reported incidence than any other disease of animals transmitted to man.

While great strides have been made in the last few years in the control of bovine brucellosis, and the incidence of the infection in cattle has been greatly reduced, the decrease in notified incidence in man cannot be clearly related to the success of the control program. Swine continue to be an important source of infection for man.

Despite the decrease in the number of reported cases, the problem of establishing the diagnosis of the disease in man remains an important one. Isolation of the organism from the patient is the only proof of diagnosis. A significant titer in the standard seroagglutination test, or a rising titer, provides presumptive confirmation of a clinical diagnosis. In chronic brucellosis a fluctuating titer is suggestive of active disease. The widespread and often indiscriminate use of the broad-spectrum antibiotics makes cultural proof more difficult, and greater dependence must be placed upon the agglutination test. The skin test has no value as a diagnostic aid.

The current therapy of choice consists of a combination of dihydrostreptomycin and tetracycline, with or without the addition of sulfadiazine or triple sulfonamide. As all presently available drugs primarily suppress the infection, treatment must be continued for a period of time sufficient to allow the body to dispose of the infection. Bed rest is essential. Local lesions may require longer medical treatment or definitive surgical treatment.

Vector Relationships of Arthropod-borne Encephalitides in North America

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Although much remains to be learned about the ecology of the arthropod-borne encephalitides in North America, past and recent studies

increase in the number of lymphoid cells in the allantoic fluid; in inoculums containing heat-inactivated virus, the cellular response is absent. Serial passage of inoculated egg material has failed to show reproduction of murine and human hepatitis viruses in avian tissue. Four logs of mouse-infective virus are required to elicit the cytological response in embryonated eggs, thus indicating that the egg is very much less sensitive to virus than the natural host.

Mouse hepatitis virus does not propagate in "L" strain of mouse fibroblast in tissue cultures, and human hepatitis virus has induced no detectable cytopathogenic effect in cultures of human tissues.

A soluble complement-fixing antigen has been extracted from liver emulsions of mice infected with hepatitis. The antigen can withstand desiccation, heat, extraction with ether, and freezing; it does not sediment at 120,000 gravities for 2 hours. "Normal" liver does not contain this antigen. An antigenic relationship of mouse hepatitis virus to human disease has not been demonstrated.

Neutralizers of Human Viruses in Animal Serums

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Certain domestic animals, particularly cows, have neutralizing substances in their serums against certain human viruses such as polioviruses, coxsackie, and adenoviruses. These antibodies occur in the absence of any known infection with the agents and raise the question of their interpretation. Are they true antibodies?

A study of the neutralizing substance against polioviruses in cow serums revealed the following characteristics: It is a globulin, heat stable at 60° C. for 30 minutes and highly specific. Some serums have no neutralizing substances; others have neutralizing substances to types 1, 2, and 3 polioviruses or combinations of these. There is evidence of passive transfer: newborn calves commonly have neutralizing substances that disappear at 4 to 5 months and gradually

reappear over a period of time in the traditional fashion of antibodies. Titers are variable and may be quite high: dilutions greater than 1:128 neutralize 100 TCD.

A review of the literature indicates that although certain nonspecific inhibitors may have one or more of these properties, no substance other than specific antibody is known to have all of these properties.

Even when one has determined that he is dealing with a true antibody, a more difficult question remains. What is the nature of the antigenic stimulus for the antibody? Cross reactions between viruses of which there are already many examples (canine distemper and measles, vaccinia and variola, swine influenza and influenza, psittacosis and lymphogranuloma venereum) make final interpretation or origin impossible.

The problem is particularly difficult in surveys of animal serums when one does not have the orienting information of a known reservoir, or an epidemic situation with a characteristic clinical picture and paired serums to observe a fourfold rise in titer.

Although one may conclude that the neutralizing substances in bovine serums are true antibodies that react with polioviruses, coxsackie, and adenoviruses, the final interpretation as to the origin of these antibodies requires the isolation of a specific agent that can explain the antibody pattern. In the absence of such isolations, the origin must remain an object of closely reasoned but inconclusive speculation.

Brucellosis in Livestock

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Brucellosis in livestock continues to be an important economic burden and public health threat in many sections of the United States.

Since 1934 a cooperative State-Federal program for the control and eradication of bovine brucellosis has been in operation. During that time the number of reactors disclosed through blood agglutination testing has declined from

exists in the central and east central States, where *C. tarsalis* is not abundant. There *Culex pipiens* or *Culex quinquefasciatus* are apparently the important epidemic vectors and a high proportion of the cases are urban or suburban.

The mechanics of an urban epidemic appear clear. Infected wild birds probably introduce the virus to high populations of suburban and urban *C. pipiens* or *C. quinquefasciatus*, which rapidly spread it to city-dwelling birds and chickens. These, in turn, serve as a ready source of infection for additional numbers of the mosquitoes. A consequence of the resultant bird epizootic is exposure of a large segment of the human population to infection by mosquito bite. The vectors responsible for the initial infection of the wild birds are unknown, but widespread sylvan mosquitoes may be involved.

Control measures through vector abatement are often economically impractical. Only urban SLE gives immediate promise of relatively inexpensive control. It is obvious, therefore, that continued investigations on the ecology of encephalitis are necessary.

Changing Picture of Murine Typhus

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The changing picture of murine typhus in the United States can be shown by comparing

two 4-year periods, 1941-44 and 1953-56. In the first period the number of cases of murine typhus increased to a peak of 5,401 in 1944, while in the latter period the number of cases decreased to 98 in 1956. This is the first year since 1924 that less than 100 cases of murine typhus have been officially reported to the Public Health Service.

Treatment in the first period was largely symptomatic; today, broad spectrum antibiotics, such as chloromycetin, aureomycin, and terramycin, give quick and effective cures. The use of these new drugs, however, probably obscures the true incidence of the disease. They mask all types of rickettsia infection, making diagnosis with laboratory confirmation difficult or rare.

Prevention of murine typhus during the first 4-year period was based on controlling rat fleas, rat trapping, rat poisoning (using relatively ineffective rodenticides such as red squill), rat proofing, and sanitation. Today, in addition to these methods, there are powerful insecticides which control infected rat fleas for weeks or months. Many new rodenticides have been developed, particularly the anticoagulants, which control rodents effectively and thus limit the flea population.

Improved sanitation programs in cities throughout the United States, and increasing reliance of private industry on commercial pest control services, have probably had a long-term influence on the steady decrease of murine typhus.

John W. Cronin, 1905-1958

Dr. John W. Cronin, Assistant Surgeon General of the Public Health Service, and chief of its Bureau of Medical Services since November 1956, died of a heart attack March 26, 1958.

Born June 15, 1905, in Springfield, Ohio, he began his career with the Public Health Service in 1932. As chief of the Hill-Burton program from 1949 to 1956, he is credited with rallying State support for the construction and enlargement of hospitals, nursing homes, and clinics throughout the United States.

Dr. Cronin was a graduate of Miami University, Oxford, Ohio, and of the Cincinnati University College of Medicine.

have provided a considerable knowledge of these diseases. The most probable hosts and vectors have been revealed.

Field investigations have shown fresh water swamps to be the foci of eastern equine encephalitis (EEE) infection. Wild birds captured in swamps have frequently been found infected, and numerous virus isolations have been made from *Culiseta melanura*, a swamp-inhabiting mosquito which feeds principally upon birds.

Because of its restricted habitat and feeding preferences, *C. melanura* is probably unimportant in the direct epidemic spread of EEE to horses and man. Although it appears to play the important role of maintaining the virus in its endemic foci, the spread of the disease outside of these foci is most likely dependent upon other mosquito species which feed commonly upon horses and man.

Certain conditions appear necessary to permit an epizootic in horses (and an epidemic in man) to occur. Bird infection within the swamp foci would need to be at high level, furnishing a relatively great source of virus for mosquito infection. This condition would depend upon an adequate population of *C. melanura* (and perhaps other susceptible bird-feeding, swamp-inhabiting species), and a low immunity rate in the bird population. The latter would, in turn, depend upon a light infection rate the previous year. With a large number of birds infected, inevitably some of them fan out into adjacent nonswamp areas and serve as sources of infection for other mosquito species which will feed upon horses and man. The scattered distribution of the infected birds, together with a lack of strong bird-feeding proclivity on the part of the mosquitoes, results in only a very low mosquito infection rate; this must be compensated for by large mosquito numbers. If, in addition to all this, there is also a low immunity rate in the horse population, conditions are proper for an epizootic. Once the epizootic is under way, some transmission from horse to horse by mosquitoes and biting flies without the intervention of birds is probably also possible.

The ecology of western equine encephalitis (WEE) has undergone intensive investigation over many years. Serologic and virus isolation

studies in wild birds have firmly established their role as the most important hosts, and hundreds of isolations of the virus from *Culex tarsalis* attest to the close association of this mosquito species with natural sources of infection. Since it is widespread in distribution, occurs in large numbers, feeds freely upon man and horses as well as birds, is exceptionally susceptible to infection, and transmits with high efficiency, it fulfills requirements for both an endemic and epidemic vector. It undoubtedly is responsible for the bulk of the WEE transmission to birds, horses, and man throughout its range in the western part of the United States. *Aedes* mosquitoes appear to play only a minor role in epidemic transmission.

Until a few years ago the distribution of WEE was believed to be limited to that of *C. tarsalis*. It is now known that it does occur in mosquitoes and birds in the East in the absence of *C. tarsalis*, however, but does not cause disease in man and is only rarely seen clinically in horses. In the East the enzootic status of WEE appears to be similar to that of EEE, with *C. melanura* in fresh-water swamps playing the role of the principal enzootic vector. The absence of a highly efficient epidemic vector, such as *C. tarsalis*, is probably the main factor in keeping the virus within discrete enzootic foci. Also, laboratory studies have shown that animals immune to EEE respond to WEE infections with significantly lower viremias. This may be a contributing deterrent to the epidemic spread of WEE in areas where a high proportion of birds and horses possess EEE antibody.

St. Louis encephalitis (SLE), like EEE and WEE, is primarily an infection of birds transmitted by mosquitoes, with man an unfortunate, accidental host. The virus of SLE differs from those of EEE and WEE, however, in having a reversed mosquito susceptibility range. It readily infects all species of *Culex* mosquitoes which have been tested, whereas EEE and WEE viruses find most *Culex* species (except *C. tarsalis*) almost totally refractory.

In the far west, *C. tarsalis* is the main vector of SLE and, as would be expected from the breeding habits of this mosquito, most of the human cases are rural. A different situation

EJECTION

and AUTOMOBILE FATALITIES

BORIS TOURIN, B.A.

PRIOR to the advent of studies of injuries sustained in automobile crashes, the belief was prevalent that being "thrown clear" of the car during an accident would generally save one's life. As the Automotive Crash Injury Research project of Cornell University Medical College accumulated case histories from the reports of trained police and highway patrol investigators, however, it became clear that this supposition was contrary to the evidence.

The present study uses data from these reports to answer two initial questions: Is the risk of fatal injury greater for those ejected from automobiles in an accident than for those who remain inside? What fatality would be expected for those ejected had they remained inside the cars?

Answers to these questions are applied to data on national fatality figures in order to answer a third question, which is the principal objective

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of this study: If ejection increases the risk of fatality, what is the estimated number of lives that could be saved annually by preventing ejection in injury-producing accidents?

The present study is an extension of an earlier one in which it was observed that ejection from an automobile under crash impact conditions was associated with a double risk of moderate through fatal injuries (1). Both the previous and present studies represent portions of the large-scale investigation of injuries in automobile crashes conducted at Cornell University Medical College. The general plan and organization of this investigation have been described in previous reports (1-4).

Materials

Detailed accident-injury reports, containing comprehensive information on 3,261 passenger automobiles and their 7,337 occupants, were collected and analyzed and subsequently coded and transferred to punchcards.

All of these accidents had resulted in injury of some kind to at least one of the occupants involved. The accidents ranged in severity from minor to extreme, and the injuries ranged in degree from trivial to fatal.

All common makes and models of American automobiles manufactured prior to 1956 and operated during the sampling period (beginning of 1953 through May 1956) were repre-

Home Accident Prevention Text

PHS Publication No. 564. 1957. 24 pages. 15 cents.

The Home Accident Prevention Text provides both guidance and reference suggestions for all categories of local public health workers whose cooperation will be required in a local home accident prevention program. Following an introductory survey of environmental, physical, mental, and emotional factors in home accidents, the booklet analyzes the roles of the health officer, public health nurse, sanitarian, and other health personnel. The important contribution of the private physician to the success of local programs and the value of cooperation with other agencies in the community are stressed.

One Way to Develop Local Home Accident Activities

PHS Publication No. 566. 1957. 10 pages. 35 cents.

Designed to aid local health departments, *One Way to Develop Local Home Accident Activities* outlines a "learning by doing method." It presents a four-point program: staff orientation, local resources, the local problem, and suggested activities.

Sources of Morbidity Data, Listing Number 5, 1957

PHS Publication No. 565. 1957. 31 pages.

This fifth listing of projects in the files of the Clearinghouse on Current Morbidity Statistics Projects describes 105 projects not previously reported. The projects are grouped according to the major type or types of disease, injury, or impairment with which they deal.

There are three indexes: the projects by type of data collection, the organizations and institutions responsible for the research, and the principal investigators. Also included is a section of supplementary notes on projects in progress when their descriptions were received by the clearinghouse for inclusion in previous listings.

Since the listings of the clearinghouse are published primarily for the use of actual and potential contributors, the number of bound copies for other distribution is limited. Tear sheets of the description of each study are available, however, to research workers or persons planning public health programs.

Survey of Compounds Which Have Been Tested for Carcinogenic Activity, Supplement 1

PHS Publication No. 149. Supplement 1. 1957. By Philippe Shubik and Jonathan L. Hartwell. 388 pages. \$3.50.

This supplement surveys the literature from 1938 through 1943 on compounds that have been tested for cancer-producing properties in experimental animals. Having the same format as its predecessor, it combines in tabular form experimental data on nearly 1,000 compounds, of which about one-fifth are cancer-producing in animals.

The compounds are arranged alphabetically in classes, and the data cited include reference, species and number of animals, route of administration, number and type of tumors, and duration of experiment. A cumulative compound index, one of several indexes, includes the listings in both PHS Publication No. 149 and the supplement.

Because of the growing importance of chemicals in food, drugs, and cosmetics, and the increasing aware-

ness of the possible long-range effects of these and other materials such as the products of combustion of tobacco and gasoline on the human organism, the book should be useful to anyone interested in environmental cancer as well as cancer investigators.

Research Grants and Awards, National Institutes of Health, 1957

PHS Publication No. 571. 1957. 177 pages. 45 cents.

Health research facilities grants, research fellowships, and research grants awarded by the National Institutes of Health during fiscal year 1957 are listed separately by State and institution.

Toward a Healthier World—Your Career in Sanitary Engineering

PHS Publication No. 579. 1958. 10 pages; illustrated. 25 cents.

This is the first career guidance pamphlet to describe sanitary engineering. Designed especially for high school students, it covers past achievements of sanitary engineers, their present and future work, the need for such engineers, salary, possible employers, and educational requirements.

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared by other Federal agencies.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications other than its own.

been avoided in the sample if ejection had been controlled. The proportion thus obtained, when applied to national fatality figures, provides an estimate of the number of lives that could have been saved by preventing ejection.

Fatality Risks in Ejection

Among the 7,337 occupants of passenger automobiles involved in any type of injury-producing accident, 13.6 percent were completely ejected, and 81.6 percent remained inside the car. Information on the remaining 4.8 percent of the occupants was doubtful, and these were eliminated from the study.

In table 1, persons completely ejected are compared with persons who definitely remained inside the car, and the proportion of fatally injured persons in the two groups is shown, thus providing an answer to the question: Is the risk of fatal injury greater for ejected persons than for those who remain inside the car?

There were 9.6 percent fewer fatalities among those not ejected than among those ejected ($P<.001$). Further, the risk of fatality among the ejected was demonstrated to have been nearly five times as great as that among those not ejected: 12.1 percent for those ejected versus 2.5 percent for those not ejected. These data clearly suggest that the number of fatalities in automobile accidents would be reduced by minimizing the occurrence of ejection.

The material which follows deals with the methodology and rationale employed in predicting the number of lives that would have been saved in the sample if those ejected had not been ejected. This methodology must, of

course, take into account the fact that a certain number of persons, even if they had remained inside the car, would nevertheless have been exposed to some risk of fatal injury; that is, at least the 2.5 percent risk experienced by those not ejected. Thus it must by no means be assumed that the 5 to 1 ratio seen in table 1 implies an 80 percent reduction in the total number of fatalities if ejection is eliminated. Furthermore, it also cannot be assumed that the occurrence of fatality is related exclusively to the occurrence of ejection or nonejection. Other accident-injury factors must be taken into account.

Accident Severity, Seats, and Fatality

As has been indicated in table 1, the risk of fatality was greatly influenced by the occurrence of ejection. In addition, the influence of at least two other major variables affecting both the frequency of ejection and the risk of fatality have been definitely established in previous research (6, 7) and have to be taken into account. These factors are accident severity and seated position, both of which are believed to have sufficient bearing on the subject of this investigation to warrant particular attention.

Figure 1 illustrates the frequency of fatality in progressive categories of accident severity. Statistical analysis of the data, revealed a significant increase ($P<.001$) in risk of fatality as accident severity increased. Figure 2 illustrates the frequency of fatality among car occupants according to seated position occupied and shows that the risk of fatality was significantly different ($P<.001$) for occupants of different positions. In these two figures, in order to eliminate over-emphasizing driver injury, data on drivers alone and drivers with passengers are presented separately.

The effect of these same factors on the frequency of ejection is illustrated in figures 3 and 4. Figure 3 illustrates that as accident severity progressively increased, the frequency of ejection significantly increased ($P<.001$). Figure 4 illustrates the varying and significantly different ($P<.001$) frequencies of ejection depending on seated position. In particular, the rear seat area produced much lower risk of ejection than the front seat area. This was due

Table 1. Risks of fatal injury for those ejected and those not ejected

| | Not fatally injured | Fatally injured | Total | Percent fatally injured |
|--------------|---------------------------|--------------------|--------|-------------------------------|
| Ejected..... | 876 | 121 | 997 | 12.1 |
| Not ejected | 5, 843 | 147 | 5, 990 | 2.5 |
| Total..... | 6, 719 | 268 | 6, 987 | 3.8 |

¹ Data on 350 of the 7,337 occupants studied have been omitted since details on ejection were not completely reported for these persons.

sented. Those manufactured after 1956 were excluded because many manufacturers improved their door locks in that year. Doors equipped with these new lock mechanisms have been demonstrated to open less frequently under crash impact conditions and to be associated with a decrease in the frequency of ejection (2).

The data were collected at the accident scene in 14 States and 1 city: Arizona, California, Colorado, Connecticut, Indiana, Maryland, Michigan, Minnesota, New York, North Carolina, Pennsylvania, Texas, Vermont, Virginia, and Minneapolis. The States provide the sample with rural accidents; the city, with urban accidents.

In each participating area, police or highway patrolmen in preselected geographic districts completed special report forms and submitted detailed photographs for each injury-producing accident. Examining physicians supplied precise medical information on each injured person. History, data sources, and general methods of the Automotive Crash Injury Research project have been previously outlined (3, 4).

These accidents are believed to be representative of typical crashes in which persons were injured (3).

Another source of material was the national motor vehicle fatality figures gathered by the National Office of Vital Statistics and reproduced by the statistics division of the National Safety Council (5). Such data are published annually in Accident Facts, where tabulations of accidental deaths and injuries from many sources are collected and classified under gross cause headings.

Methodology

Of all the passenger car occupants who were fatally injured, a distinction was made between those whose injuries resulted from contact with structures inside the car and those whose injuries were the direct consequence of complete ejection from the car, that is, the injuries were sustained outside the car. The 2 frequencies of fatal injury result in 2 different risks of fatality.

The following hypothesis was adopted to determine the expected risk of fatal injury for

Definitions

Accident severity: Total decelerative forces and overall structural damage produced by the accident, described in five grades: (1) minor; (2) moderate; (3) moderately severe; (4) severe; and (5) extremely severe and extreme. These terms do not describe the injury effects of the accident, but only the forces and structural damage conditions.

Complete ejection: Complete ejection through a door that has "popped open" as a result of impact against some portion of the car other than the door in question. Occupants defined as completely ejected must be outside the car before sustaining their principal injuries. Doors opened by direct impact to the doors themselves are not classified as open in studies concerned with ejection since occupants adjacent to these doors are quite likely to have been seriously injured prior to leaving the car.

Seated position: The position determined by where an occupant might sit: driver, right front, center rear, and so on.

Serious and critical injuries: Injuries which, because of their nature and severity, are potentially or actually dangerous to life.

those ejected had they remained inside the car, with the other circumstances remaining unchanged. It was postulated that had the occupants not been ejected, their risk of fatality would have been equivalent to the observed risk among persons who actually remained inside the car, in corresponding seats, and under the same force conditions. Pursuing this hypothesis, data were first arranged to show the observed risk of fatality for unejected occupants in each category of seated position and accident severity. The expected number of fatalities among persons ejected from corresponding seated positions and in accidents of comparable severity could then be obtained by using the method of observation and expectancy.

Pursuing the original hypothesis further, the expected number of fatalities among occupants of all seats and in accidents of all severities, assuming that none had been ejected, was then compared with the observed number of fatalities to establish the proportion that would have

dent severity and seated position. For example, it is shown from the data in table 2 that among 578 nonejected right front seat occupants involved in moderately severe accidents, there were 6 fatalities, while among 115 ejected right front seat passengers in accidents of the same severity, there were 14 fatalities. To calculate the expected number of fatalities if ejection had not taken place, the data were arranged as a simple ratio: the expected number of fatalities among the ejected is to the total ejected as the observed number of fatalities among the nonejected is to the total nonejected. Expressed numerically, the ratio reads, $x:115::6:578$.

The expected number of fatalities among ejected persons was 1.19 (or about 1 person). But among the 115 ejected persons observed, there were actually 14 killed. Thus, in the given category of seated position and accident

Figure 3. Frequency of ejection according to accident severity.

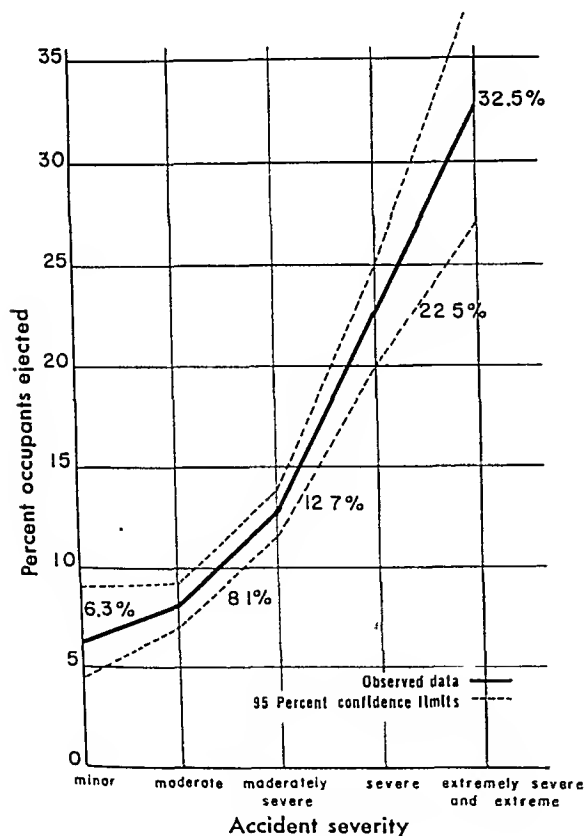
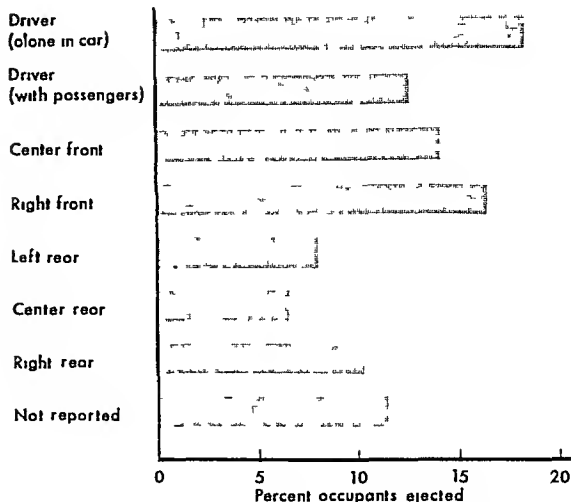


Figure 4. Frequency of ejection from different seats.



severity, there were 13 more people killed than would have been expected if there had been no difference between risks of fatality for ejected and nonejected persons.

By totaling the observed and the expected fatalities in table 2 for each seated position and within ranges of severity, and then subtracting one from the other, the basis was provided for an estimate of the number of lives that could have been saved in the 3,261 accidents surveyed if ejection had not occurred. There were 121 observed fatalities and 53 expected fatalities among those ejected, a difference of 68, therefore, between the two.

The total number of fatalities observed among all occupants, whether ejected or not, was 268. Since 147 of these were among the nonejected group, they would not be affected by preventing ejection, and the expected number of fatalities here would be the same as the number observed. Therefore, preventing ejection could have reduced the number of fatalities by 68, leaving only 200 fatalities. (The 200 expected fatalities could also have been determined in this way: 147 observed among nonejected, plus 53 expected among ejected under the hypothesis.)

This reduction, expressed as the proportion 200/268 (74.6 percent), can be applied to the national fatality figures for passenger car occupants to obtain the estimated number of fatalities that would still occur throughout the Na-

largely to the fact that about half of the cars observed were two-door models; rear seat occupants were seldom ejected through the front doors.

Observed and Expected Risks

It has been clearly demonstrated that those ejected are much different from those not ejected with respect to risk of fatality and that, further, fatality risks will fluctuate considerably according to seated position and accident severity. The available data on these three factors affecting fatality risks were used to determine the answer to the question: What would have been the expectations in terms of fatality for the ejected had they remained inside the cars?

Strictly speaking, of course, it is impossible to determine what would have happened to any specific ejected person in a single, hypothetical situation if he had remained inside the car. However, given certain reasonable assumptions,

Figure 1. Frequency of fatality according to accident severity.

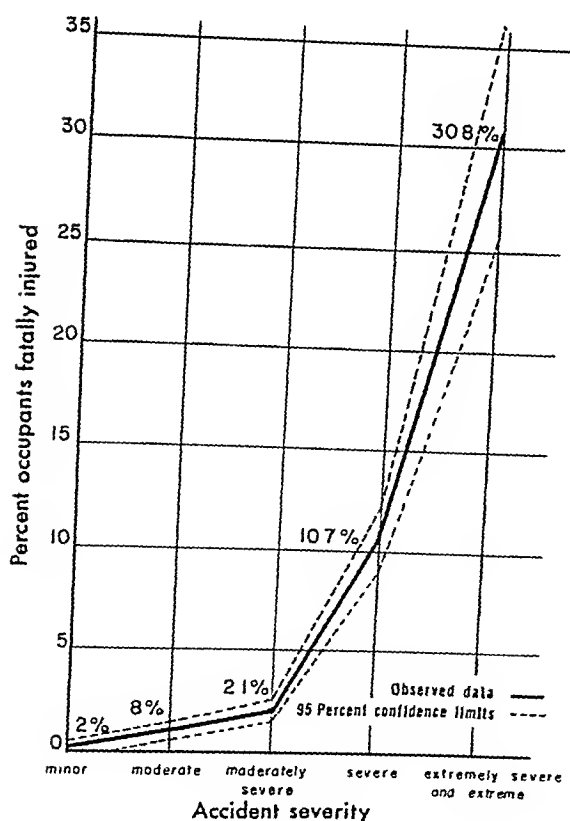
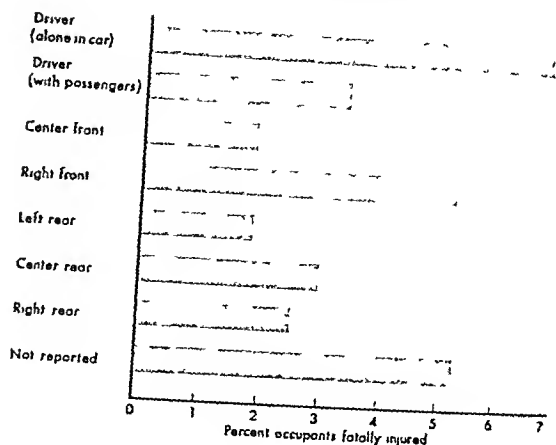


Figure 2. Frequency of fatality among all occupants of different seats.



it is possible to obtain an estimated (or predicted) number of fatalities representing the fatality risk of a category or group rather than of any individual in that category or group. Predictions under such conditions are described as expectations under a given hypothesis or, more briefly, expectations.

The volume of data on nonejected persons, 81.6 percent of the total number in this study, is sufficiently large so that the risks of fatal injury associated with given seated positions under given conditions of accident severity may be assumed to be representative for any single occupant who remains inside the car. A reasonable assumption is that the fatality risks to which a given ejected person would be exposed were he not ejected would be comparable to the fatality risk encountered by a group of nonejected occupants subjected to the same conditions of accident severity in a seated position corresponding to that from which the ejected person had been thrown. The fatality risks for nonejected persons according to accident severity and seated position can be taken directly from basic data. These observed fatality risks thus obtained provide a reasonable basis for calculating the expected number of fatalities that would have been encountered among ejected persons if they had stayed in their seats.

Calculations for Expectancies

Simple algebraic calculations, based on the rationale described above, yielded the expected number of fatalities in each category of acci-

tion even if ejection were controlled (3). Roughly 75 percent would still occur, which means a reduction of 25 percent.

National Fatalities

The National Office of Vital Statistics reported 39,628 deaths resulting from motor vehicle accidents of all descriptions in 1956. The annual figure has been fairly constant over the past 5 years (5). Since these tabulations included all persons fatally injured, under whatever circumstances, in accidents associated with motor vehicles of every description, they were not all applicable to the present study, which is concerned exclusively with fatal injury to passenger car occupants. Therefore, certain eliminations were needed in order to obtain the basic applicable figure accounted for by passenger car occupants among the national fatalities.

Among the fatalities eliminated were those incurred when motor vehicles collided with pedestrians or cyclists, since fatal injuries in these accidents were more likely to have been sustained by the latter than by the occupants of the motor vehicles. The nature of the National Safety Council's tabulations, subclassified under various categories, permitted the elimination of these fatalities without difficulty (5).

A further elimination was required with respect to fatalities among occupants of street cars, buses, trucks, and any other vehicles which could not be classified as passenger cars. Unfortunately, the national accident fatality tabulations did not distinguish between deaths among occupants of passenger cars and occupants of other motor vehicles. However, gross figures supplied by the National Safety Council (5), through data collection of the National Office of Vital Statistics (8), provided for the estimation that about 75 percent of the motor vehicles involved in fatal accidents were passenger cars. Most of the remaining 25 percent were trucks, which normally carry fewer passengers than automobiles. Therefore, it is perhaps overgenerous to presume that 25 percent of the fatalities in these accidents were sustained in vehicles other than passenger cars.

The results of all the above eliminations may be observed in table 3.

These eliminations result in a conservative estimate of 23,678 deaths annually among occupants of passenger cars involved in accidents. Roughly 87 percent of these deaths (20,528) occurred in rural accidents; the balance of 13 percent are accounted for by accidents in urban areas. In the following section it is estimated how many of these 23,678 lives might have been saved by preventing ejection. Since the estimate of passenger car occupant fatalities is very cautious, the predicted number of avoidable fatalities may represent an underestimation. In any case, it can safely be regarded as a minimum figure.

Application of Reduction Proportion

We have estimated that prevention of ejection could eliminate 25 percent of the fatalities observed in the study sample. Before applying this percentage to the adjusted estimate of 23,678 annual deaths among passenger car occupants throughout the Nation, certain differences between the sample data and the national tabulations had to be taken into account. For example, among those national fatalities pertinent to the problem (table 3), roughly 20,000 occurred in rural areas and about 3,000 in urban areas, with the ratio of rural to urban fatalities amounting to somewhat more than 6 to 1. In the sample studied the ratio of rural to urban fatalities was about 25 to 1.

Therefore, applied to national figures, the

Table 3. Motor vehicle fatalities, 1956¹

| Classification | Total | Rural | Urban |
|---|--------|--------|-------|
| Total..... | 40,000 | 30,400 | 9,600 |
| Pedestrians, cyclists.... | 8,430 | 3,030 | 5,400 |
| Balance..... | 31,570 | 27,370 | 4,200 |
| Trucks, buses, others (25 per- cent of balance).... | 7,892 | 6,842 | 1,050 |
| Balance (pas- senger cars)..... | 23,678 | 20,528 | 3,150 |

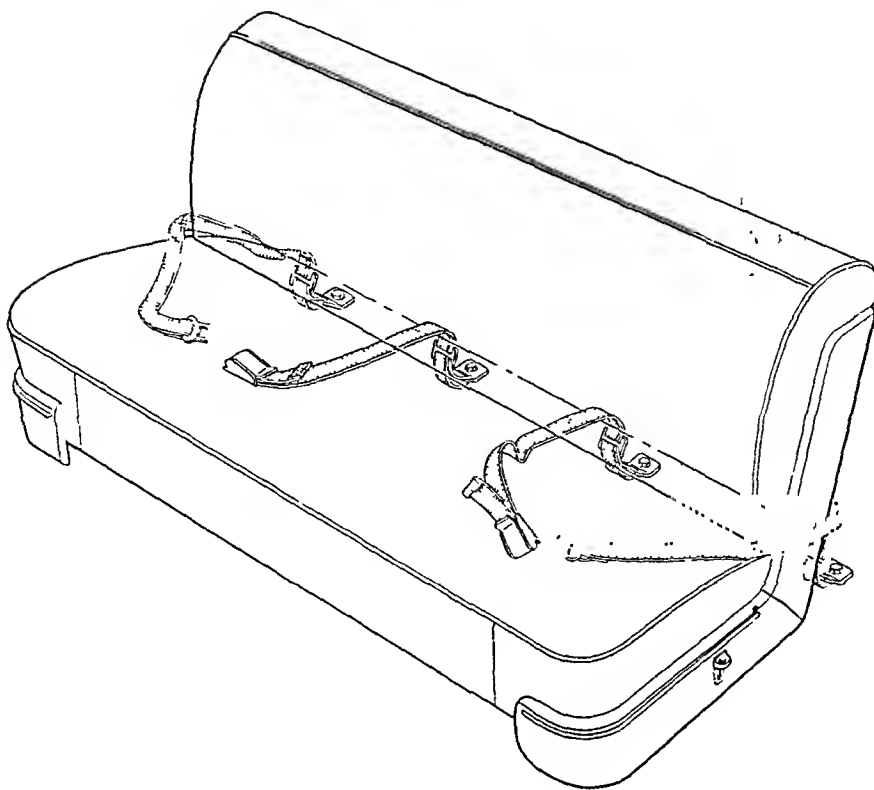
¹ Derived from 1956 fatality figures published in *Accident Facts* (5), and based on mortality data collected by the National Office of Vital Statistics.

² A more accurate figure (39,628) has been recently released by the National Office of Vital Statistics, but corresponding adjustments for the detailed groups in the table are not yet available.

Table 2. Observed and expected fatality frequencies among those ejected, with regard to accident severity and seats occupied

| Accident severity, by seat occupied | Nonejected | | Ejected | | |
|-------------------------------------|------------------------|----------------------------------|------------------------|----------------------------------|----------------------------------|
| | Total persons observed | Fatally injured persons observed | Total persons observed | Fatally injured persons observed | Fatally injured persons expected |
| Minor..... | 436 | 0 | 30 | 1 | 0.9 |
| Driver alone..... | 62 | 0 | 10 | 1 | .0 |
| Driver with passenger..... | 122 | 0 | 5 | 0 | .0 |
| Center front..... | 34 | 0 | 1 | 0 | .0 |
| Right front..... | 101 | 0 | 9 | 0 | .0 |
| Left rear..... | 33 | 0 | 2 | 0 | .0 |
| Center rear..... | 20 | 0 | 1 | 0 | .0 |
| Right rear..... | 39 | 0 | 2 | 0 | .0 |
| Seat unreported..... | 25 | 0 | 0 | 0 | .0 |
| Moderate..... | 2,025 | 7 | 183 | 8 | .63 |
| Driver alone..... | 265 | 2 | 32 | 3 | .21 |
| Driver with passenger..... | 609 | 1 | 42 | 2 | .0 |
| Center front..... | 177 | 0 | 21 | 1 | .0 |
| Right front..... | 491 | 2 | 65 | 2 | .27 |
| Left rear..... | 131 | 0 | 4 | 0 | .0 |
| Center rear..... | 68 | 1 | 3 | 0 | .01 |
| Right rear..... | 150 | 0 | 9 | 0 | .0 |
| Seat unreported..... | 134 | 1 | 7 | 0 | .05 |
| Moderately severe..... | 2,276 | 21 | 351 | 31 | 3.21 |
| Driver alone..... | 329 | 0 | 70 | 0 | 1.27 |
| Driver with passenger..... | 680 | 4 | 100 | 8 | .59 |
| Center front..... | 187 | 1 | 20 | 0 | .15 |
| Right front..... | 578 | 6 | 115 | 14 | 1.19 |
| Left rear..... | 167 | 0 | 8 | 0 | .0 |
| Center rear..... | 79 | 1 | 3 | 0 | .01 |
| Right rear..... | 166 | 1 | 11 | 3 | .07 |
| Seat unreported..... | 90 | 2 | 15 | 0 | .33 |
| Severe..... | 868 | 75 | 283 | 44 | 24.45 |
| Driver alone..... | 126 | 16 | 62 | 12 | 7.87 |
| Driver with passenger..... | 241 | 18 | 76 | 9 | 5.68 |
| Center front..... | 76 | 3 | 22 | 2 | .87 |
| Right front..... | 215 | 25 | 80 | 16 | 9.30 |
| Left rear..... | 62 | 1 | 8 | 0 | .13 |
| Center rear..... | 40 | 2 | 1 | 0 | .0 |
| Right rear..... | 66 | 5 | 16 | 1 | 1.21 |
| Seat unreported..... | 42 | 5 | 15 | 4 | 1.79 |
| Extremely severe and extreme..... | 166 | 44 | 96 | 37 | 25.45 |
| Driver alone..... | 29 | 14 | 23 | 9 | 11.10 |
| Driver with passenger..... | 44 | 9 | 24 | 9 | 4.91 |
| Center front..... | 12 | 2 | 6 | 2 | 1.00 |
| Right front..... | 37 | 14 | 18 | 6 | 2.27 |
| Left rear..... | 7 | 1 | 10 | 6 | 1.43 |
| Center rear..... | 9 | 1 | 4 | 2 | .41 |
| Right rear..... | 12 | 1 | 7 | 1 | .38 |
| Seat unreported..... | 16 | 2 | 4 | 2 | .50 |
| Total ¹ | 5,771 | 147 | 913 | 121 | 21.02 |

¹ Data on 623 of the 7,337 occupants in the sample have been omitted because of incomplete details. Ejection data were not fully reported for 350 persons, and accident severity information was not available for 273.



Typical seat belt installation.

quency, nature, and severity of injuries associated with given causes. Reliable data of this kind can guide designers and engineers toward the elimination or delethalization of specific structures found to be potentially dangerous under crash conditions.

The relationship of automobile design to injury is nowhere more apparent than in the comparison of the frequency of fatality among ejected and nonejected occupants. If doors had not sprung open during impact, occupants could not have been ejected. Even if doors had failed to remain closed, by our definition of complete ejection, no occupant wearing a fully effective seat belt could have been thrown from the car. As statistical computation has indicated, 25 percent of all fatalities among passenger car occupants can be eliminated if ejection is completely prevented. Failure to control ejection implies the loss of more than 5,000 lives each year, and these deaths can no longer be accepted as unavoidable since the means of at least partial control exists.

If occupants can be retained inside the car in

future accidents, then the injury potential associated with structures within the passenger compartment can be reduced systematically with the cooperation of the automotive engineer. The use of properly designed and installed seat belts, for example, not only protects the wearer from the risks associated with ejection but also reduces the force with which he is likely to strike objects within the passenger compartment. It has been observed under controlled laboratory conditions that the restraining action of a lap-type seat belt reduces the force of head blows by as much as one-third (9). If objects and surfaces within the reduced striking range of a seat-belt wearer are designed to absorb energy and to distribute it over a considerable area of the contacting body, a further reduction in injury-producing force is readily obtained. Preliminary studies, utilizing a paired-comparison technique, have indicated that the use of seat belts by nonejected persons is associated with a maximum demonstrable decrease of about 60 percent in risk of all grades of injury (2, 4).

Additional design modifications can be sug-

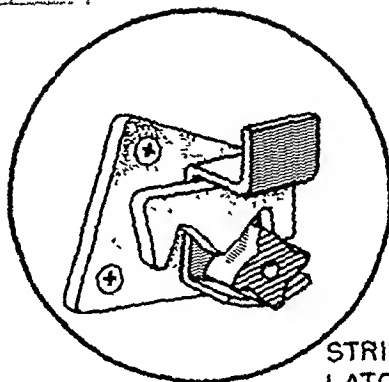


STRIKER

Typical safety doorlock.



LATCH ASSEMBLY



STRIKER, AND
LATCH ENGAGED

calculation for the percentage of reduction would have to take into account the sampling bias.

Since the sample was predominantly rural (more than 90 percent of the accidents studied occurred in nonurban areas), the estimated reduction of 25 percent could be directly applied to the 20,528 lives lost annually in rural accidents, a saving of about 5,132 lives each year. However, the full reduction of 25 percent could not be reasonably expected in urban accidents where accident conditions are frequently less severe than on rural roads. It was estimated that perhaps a 10 percent reduction could be presumed, and that about 315 of the 3,150 urban fatalities might be eliminated by prevention of ejection. Thus, a minimum of approximately 5,500 annual fatalities might be avoided in future years if the hazards of ejection were removed.

Discussion

An annual toll of approximately 40,000 deaths and more than 1,000,000 injuries (5, 8)

in motor vehicle accidents is truly epidemic in proportion, and is not likely to be brought under control except by preventive methods affecting a majority of the national population. Obviously, the ideal solution would be the elimination of accidents themselves, but it clearly must be assumed that a certain number of accidents will always take place. Furthermore, large-scale measures to prevent accidents may take years to develop.

If it is admitted that some accidents will always occur despite all efforts, then proper attention to the crash injury problem should include development and provision of controls that will operate to prevent injury when an accident occurs. Controls of this sort may be compared to the use in preventive medicine of serums and vaccines which protect the recipient from the consequences of exposure to infectious diseases.

It is the objective of automotive crash injury investigations to isolate and identify the specific causes of injury observed in injury-producing accidents, and to provide indications of the fie-

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Advisory Committee on Radiation

A National Advisory Committee on Radiation was established by the Surgeon General of the Public Health Service February 12, 1958, to advise on programs of the Service in public health aspects of radiation.

Present Service activities in this field include research, epidemiological studies, radiation monitoring of water, air, and milk, and technical assistance to the States on safety measures.

Dr. Russell H. Morgan, professor of radiology, Johns Hopkins University Medical School and radiologist in chief, Johns Hopkins Hospital, who has been serving as special consultant on these matters, is committee chairman. Dr. Donald R. Chadwick of the Office of the Surgeon General is executive secretary.

To-date committee appointments also include: Dr. Arnold O. Beckman, president, Beckman Instruments, Inc., Fullerton, Calif.; Dr. Victor P. Bond, Brookhaven National Laboratory, Upton, N. Y.; Dr. Richard H. Chamberlain, professor of radiology, University of Pennsylvania Hospital, Philadelphia; Dr. James F. Crow, professor of genetics, University of Wisconsin, Madison; and Dr. Herman E. Hilleboe, commissioner of health, New York State, Albany.

Other committee members are: Dr. Hardin B. Jones, Donner Laboratory, University of

California, Berkeley; Dr. Edward B. Lewis, professor of biology, California Institute of Technology, Pasadena; Dr. Berwyn F. Mattison, executive secretary, American Public Health Association, New York City; Lauriston S. Taylor, chief, Atomic Radiation Physics Division, National Bureau of Standards, Washington, D. C.; Dr. George W. Thorn, physician in chief, Peter Bent Brigham Hospital, Boston, Mass.; and Dr. Abel Wolman, professor of sanitary engineering, Johns Hopkins University, Baltimore, Md.

gested, and new developments tested as they become available. At present, data from more than 10,000 automobile accidents are available for use as a control group in evaluating future safety designs.

Although the present report has been concerned with ejection only as it influences the incidence of fatal injuries, the importance of ejection in nonfatal injuries, particularly those that are seriously disfiguring or disabling, should not be overlooked. Unfortunately, data are not available to predict the national reduction in nonfatal injuries that might be expected if ejection should be prevented. However, there is evidence that the percentage of passenger car occupants sustaining serious and critical injuries, whether ejected or not, is roughly the same as the percentage who are fatally injured. Previously published research findings have indicated that the number of fatal injuries sustained by passenger car occupants is similar to the number of serious-to-critical (dangerous) injuries (3). Thus, among those persons injured nonfatally in motor vehicle accidents each year, there might be some 23,670 passenger car occupants whose injuries are in the serious-to-critical range, and whose risk of sustaining injuries of this severity is at least doubled when ejection takes place. (The calculated ratio is 2.5 to 1.) Effective prevention of ejection could scarcely fail to produce a substantial reduction in the annual number of serious-to-critical injuries.

Although it is not a function of the present research in automotive crash injuries to develop the actual devices for control and elimination of the ejection hazard, data and findings suggest the provision of strengthened door locks in currently manufactured cars, automobile seat belts, and some simple and effective device for keeping doors closed on the more than 50 million pre-1956 cars still operating today.

One serious limitation of devices such as the seat belt relates to the educational and psychological difficulties in bringing about their general acceptance and use. Inevitably, a considerable number of automobile users will show more than initial resistance. But it is believed that extensive efforts aimed at encouraging widespread use of seat belts, together with constant modification of automobile components

identified as responsible for injury, will result in a significant reduction of highway casualties.

Application of the means for controlling ejection and its injurious effects is within the realm of immediate possibility. It is hoped that the goal of an annual saving of several thousand lives will provide the needed incentive.

Summary

In a sample of injury-producing accidents analyzed in the Cornell University Medical College study (3,261 passenger cars, each of which contained at least 1 injured person), 13.6 percent of all occupants were completely ejected from an automobile.

Ejected occupants of passenger automobiles had a much higher risk of fatality than those not ejected. This increase was demonstrated to be statistically significant and not due to chance.

The frequency of ejection from doors opened under crash impact conditions varied according to accident severity and seat occupied. Fatality risk was also influenced by these two factors.

Observed and expected fatalities based on a simultaneous consideration of ejection risk, accident severity, and seat occupied demonstrated that prevention of ejection from passenger cars could have reduced fatalities among passenger car occupants in the study by 25 percent.

It is conservatively estimated that about 23,700 of the approximately 40,000 lives lost annually occur among passenger automobile occupants involved in traffic accidents. Of these fatalities, about 20,000 occur in rural areas.

Elimination of ejection in passenger automobile accidents on a nationwide scale could save a conservatively estimated 5,500 lives yearly if the level of annual fatalities persists at about 40,000.

Ejection from automobiles can be prevented by the use of properly designed and installed seat belts, further refinements of the safety door lock which was standard equipment in 1956 and 1957 cars, and auxiliary devices designed to keep doors closed in older cars.

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few examples. In the 1950-56 campaign against yaws in Indonesia, more than 23 million persons were examined and $3\frac{1}{4}$ million were treated during the initial surveys, and more than 31 million examined and 1.5 million treated during the re-surveys. In Haiti, until 1950, yaws affected almost a third of the rural population. By December 1954, a total of 2.8 million people had been treated. Observation in the southern region of the country, where the campaign had been initiated, showed that less than 1 percent of the population had contagious yaws.

Similarly with syphilis; in the Ghund Valley (Simla, India) control of this disease was

achieved within a few months. When the entire population of this secluded valley was examined clinically and tested, 65 percent were shown to be positive. Penicillin was administered, and a checkup 5 months later showed that no new clinical cases had occurred.

Good results are being obtained by the use of antibiotics in mass campaigns conducted against trachoma and infectious conjunctivitis, which affect no less than 400 million people throughout the world.

Through the mass BCG vaccination campaigns (about 200 million people have been tested and around 90 million vaccinated) and the application of the new chemotherapeutic

World Health Organization, 1948-1958

At the Eleventh World Health Assembly in May 1958 in Minneapolis, the World Health Organization can look in retrospect at 10 productive years, each increasingly significant to mankind. Through its growing network of activities, whether they are part of the total war against malaria, eradication of yaws, or of environmental efforts less dramatic but equally vital, WHO has left its beneficial mark in the remotest corners of the world. Also high on the list of WHO contributions is an achievement outside the realm of health: the agency has demonstrated a working design for worldwide cooperative action on a common front.

On the occasion of the World Health Organization's tenth anniversary, the following pages are devoted to papers reflecting the agency's dynamic growth and accomplishments. Additional papers will be published following the assembly.

TEN YEARS OF WHO PROGRESS

M. G. CANDAU, M.D., M.P.H., DIRECTOR-GENERAL

• **THE WHOLE CONCEPT** of the World Health Organization and all the principles included in its constitution are based on this simple truth: in our shrunken world, health, like peace and security, is indivisible, and mankind's fight to control and eradicate disease can be won only through the concerted efforts of all of us. Therefore, when WHO was created, arrangements were made for universal membership. Today, with 88 members and associated members, such universality has almost been obtained.

Their cooperative effort has already brought a number of benefits to all. Rapid pooling of information and experience makes it simpler to

contend with diseases such as influenza and poliomyelitis, to meet the threat to mental health that grows from modern conditions of life, to adapt medical education to changing needs, and to study emerging problems such as health hazards of radiation or the mental health aspects of automation.

Countries that are struggling to conquer age-old diseases and to build up modern public health services have benefited further from the practical help given through the World Health Organization. Indeed it is for the successful fight against certain diseases widespread in the tropics and subtropics that the Organization is most widely known. Let me give you a



As a medium for the spread of medical knowledge, WHO organizes teams of specialists for international tours during which they demonstrate new techniques and report on new developments in public health. Here, a member of such a team, an internationally known surgeon, performs a demonstration operation in Cairo.

advanced techniques under conditions as similar as possible to those prevailing in their own countries.

Fellowships provide opportunity for advanced training abroad in varied subjects such as the teaching of preventive medicine, anatomy, and physiology; the organization of public health laboratories; the standardization of biologics; the medical use of radioisotopes; cell metabolism in cancer; food additives; the organization of medical education; thoracic surgery; the control of malaria, tuberculosis, venereal diseases, and congenital heart disease; psychotherapy for juvenile delinquents; psychiatric aspects of asthma; tropical architecture for health institutions; and, of course, post-graduate training in public health, nursing, sanitation, health education of the public, and similar subjects.

A great deal of effort and money has been

devoted to the fellowships program—not only the effort of the countries selecting and proposing candidates and that of WHO planning and administering the individual fellowships, but also, and most important, the effort contributed by countries and institutions of study, without whose goodwill and cooperation the program would not have been possible.

WHO Expert Advisory Panels and Committees

Expert advisory panels were established so that WHO could obtain the technical advice it needed on a particular subject either by correspondence with panel members or by inviting them to expert committee meetings. Tribute should be paid to the farsightedness of those whose idea it was to establish these panels and to those who, as members of them, have individually and collectively provided essential

agents, promising results are being achieved in reducing tuberculosis. As a result of action undertaken by national administrations, often assisted by WHO and other international and bilateral agencies, more than 350 million people can today be considered either freed from or protected against malaria.

Initiated or supported by WHO assistance, these campaigns have been carried out on every continent. One result is that, increasingly, babies are born to live, not to die. Increasingly, people can expect strength to live and capacity to work. In the past 10 years this great new promise has reached out to become reality to ever more millions of our fellow men.

Building Health Services

At the same time, the slower task of building up comprehensive health services is going forward in the member states with support from the Organization so that results achieved against communicable diseases can be consolidated. Most of the coordinating and leadership functions of WHO are directed towards this all-important objective. This fact is reflected in the growing development of inter-country education and training programs for medical and other health personnel and in the fact that today more than 40 percent of our projects in all regions are mainly concerned with education and training. In addition to providing assistance in the establishment or improvement of medical schools, nursing schools, and other training institutions, WHO experts and consultants are reviewing their curriculums and, what is even more important, their effectiveness in relation to local health needs. During the past years, it has been made clear that modern methods of combating disease and promoting health are useful only if their application is satisfactorily adjusted to widely differing stages of social, cultural, educational, and institutional development. Only in this way can the people for whom the measures are designed accept them and put them into practice as an integral part of their own ways of life.

It remains generally true, however, that experience gained in one area can be usefully applied in others. Seminars, conferences, and

study tours arranged on a regional or inter-regional basis, in addition to providing inspiration and stimulus to their participants, are considered to be increasingly useful as vehicles for the exchange of scientific information and experience.

Among the conferences held during the past 10 years to promote medical education was one in New Delhi, where 132 medical education experts gathered to examine the type of training needed to solve India's shortage of medical manpower. A conference held in Chile, and attended by deans and professors from 40 medical schools in South America, discussed the teaching of preventive and social medicine. Israeli medical officers have benefited from the pooled experience of visiting public health workers. Anesthetists from many countries have been and are being trained in special courses in Copenhagen. Physicians have been instructed, also in Copenhagen, in the management of acute bulbar forms of poliomyelitis by the application of Lassen's method. Sanitary engineers have had an opportunity to further their knowledge through seminars organized at Leiden, Milan, and other places. Treponematologists have been given similar opportunities in Stockholm and Bangkok. Malariaologists have received training in Amami, Bukavu, Guatemala City, Lagos, Lisbon, London, Maracay, Mexico City, Rome, and Yaoundé. Many other medical and public health workers have received similar training in a number of countries.

An even more direct form of international training is that afforded by WHO fellowships which enable public health workers to attend, for periods ranging usually from 3 to 12 months and, occasionally, for even longer periods, public health schools or specialized institutions to obtain advanced training or observe new methods and techniques, and bring back to their countries the benefit of their new knowledge. During its first 10 years, WHO awarded 6,396 fellowships. The truly international character of this program is revealed by the fact that during a 1-year period 1,100 fellows were received by 577 institutions in 42 countries. A growing number of fellowships have been devoted to studies within regions, so that fellows can obtain training and become familiar with



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technical advice for the development of the Organization's programs.

The Publications Program

It is important that the new facts obtained by scientists working under the auspices of WHO should find as wide an audience as possible, and the Organization, therefore, has emphasized its publications program. Besides the Technical Report Series (in which the reports of the expert committees appear), the program includes the *Bulletin*, which is a scientific periodical; the *Chronicle*, which contains a monthly account of work carried out under the auspices of WHO in various parts of the world; the *International Digest of Health Legislation*, which contains health legislation texts in full or in summary form; the *Epidemiological and Vital Statistics Report*, and the *Annual Epidemiological and Vital Statistics*, which contain mortality and morbidity statistics from



One of the features of the campaign in Egypt against trachoma, a disease usually contracted in childhood, is a pilot project run by the government with the aid of WHO and UNICEF in which school children in a selected area are taught to treat themselves with antibiotics.

many countries. There are also the individual books such as monographs on maternal and mental health, plague, influenza, poliomyelitis, biology of treponematoses, meat hygiene, and toxic hazards of certain pesticides to mention to list only a few. These publications contain not only results of work undertaken under WHO auspices but also material from outside contributors concerning facts and studies which may be usefully disseminated to public health workers in all countries.

The publications program forms part of WHO's worldwide services from which even the most advanced countries can benefit. These services comprise the recommendation of international standards for biological substances; establishment of specifications and the selection of nonproprietary names for the more important pharmaceutical preparations coming on the market; and control of air, land, and sea traffic from the point of view of health. The collection and study of comparable health statistics from as many countries as possible and technical advice concerning addiction-producing drugs and their control are also WHO services.

International Standardization

The publication of the first volume of the *Pharmacopoea Internationalis* and the adoption of the International Sanitary Regulations—both historic events occurred during 1951—are examples of the benefits which can derive from an international health organization, and which scarcely could have been achieved without it.

Approving the publication of the International Pharmacopoeia in May 1950, the Third World Health Assembly recommended "the eventual inclusion of its provisions in the national pharmacopoeias after the adoption of the said provisions by the authorities responsible for the pharmacopoeias." It is thus recognized that the International Pharmacopoeia (of which the second volume was published in 1955) constitutes only a recommendation: its specifications are not intended to be legal in any country but are intended mainly to serve for reference purposes when national specifications are established.

The specifications for pharmaceutical prep-



Senior officers of the Mexican Army direct a nationwide effort to eliminate malaria, deploying spray teams as they would troops. To reach remote villages, the spray team, like that shown above, may ride for hours on horseback—part of a veritable antimalarial cavalry.

arations published in the International Pharmacopoeia are all the more useful these days when international travel is on the increase, when one new medical advance follows another in rapid succession, and when countries want to take the maximum advantage of the therapeutic progress in other countries.

The biological standards for which WHO is responsible already cover scores of substances, and new ones come continually under review by the Expert Committee on Biological Standardization and by the research institutes charged with making assays.

The Organization has a special duty to discourage unnecessary use of drugs which are likely to produce addiction. It is the authority which advises whether a new substance is addiction producing or not, and its advice is given legal force by nations that are parties to the international conventions as set up by the League of Nations and the United Nations.

WHO can, and does, issue warnings about substances liable to lead to harmful habits and recommends that appropriate safeguards be applied until it can be finally established to what extent they are dangerous to public health. For example, the Organization's continual watch on the abuse of the barbiturates, amphetamines and, more recently, the so-called tranquilizers resulted in relevant resolutions of the United Nations Commission on Narcotic Drugs.

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strument applied to trade and travelers. They have tested a flexible technique of acceptance of international regulations through adoption by the World Health Assembly, as a replacement for the old, slow negotiation of many separate treaties. They have achieved some measure of harmony with modern epidemiological and public health practice. And they have contributed to the abandonment of a number of questionable technical and administrative requirements.

The epidemiological intelligence service is another example of what can be achieved through international cooperation. Governments communicate regularly to WHO information concerning cases of and deaths from quarantinable diseases. This is re-transmitted by a worldwide network of radio stations at WHO's disposal. In addition to radio messages, a printed bulletin, the *Weekly Epidemiological Record*, is sent to more than a thousand quarantine and health officers in various parts of the world. More complete notifications of particular interest to certain areas are also distributed weekly in printed or mimeographed form from Singapore, Alexandria, and Washington. This system enables maritime and airport officers anywhere to institute the necessary measures of protection, without interfering unduly with international traffic.

Concerted Effort Against Disease

With present technical developments, the control of diseases has gained new impact. One may take as an example recent developments in malaria control.

Although 230 million people have been freed from or protected against malaria, further efforts to bring safety to the more than 370 million people still exposed must reckon with the fact that certain anopheline mosquitoes have become resistant to residual insecticides. The alarming growth of this problem may be illustrated by the steady increase of resistant species of public health importance from 2 in 1946 to 38 in 1956. The problem is increasing in complexity and magnitude more rapidly than progress is being made, and not a single practical solution has been forthcoming except switching from one insecticide to another.

The WHO Technical Conference on Insect Resistance, which met in Geneva during the summer of 1957 to consider an international collaborative program of research, agreed that such a program is not only urgently needed but is essential for practical solutions in the foreseeable future of the many resistance problems.

An important fact in this context is the dynamic nature of the resistance problem as opposed to the more static nature of many of the scientific and technical problems facing the world today. The problem of the common cold, for example, may not be solved within the next decade; the problem itself is unlikely, however, to become more serious on that account. The resistance problem, on the other hand, intensifies day by day, and, as a consequence, it would be irresponsible to dismiss the real possibility of a significant increase in the incidence of vectorborne diseases of man.

Since the historic resolution on malaria eradication of the Eighth World Health Assembly (1955), more and more countries have accepted the objective of eradication as the goal of their antimalaria activities and, by the end of 1957, 76 countries and territories were either implementing or planning a program of malaria eradication. Their aggregate population represents 73 percent of the total population of all countries and territories where malaria is, or has recently been, present. There is no alternative to this course since the eradication of malaria from a single country can only be partially successful unless the same result is achieved by its neighbors and the danger of reinfestation thus eliminated.

What is true of malaria is equally true of other diseases, and there are signs that a concerted international attack on tuberculosis, leprosy, poliomyelitis, influenza, rabies, and many other diseases may turn out to be not only the most efficient, but ultimately also the most economical approach to the control of these diseases.

WHO as a Coordinator

Among examples of international coordination benefiting all countries are the International Treponematoses Laboratory Center, es-



Teams working in the WHO campaign for the eradication of yaws have examined, up to 1957, more than 60 million people in tropical regions and treated some 15 million. Typical is this Nigerian child, who, 10 days after receiving an injection of penicillin, is almost completely rid of sores.

established with WHO assistance at the Johns Hopkins University in Baltimore, Md., and the WHO Serological Reference Laboratories in Copenhagen, Denmark, and Chamblee, Ga. These laboratories are currently collaborating with many national laboratories on a number of thorny problems with WHO as coordinator. Worthwhile results have been obtained in connection with the new treponemal agglutination test, the immunological relation between the various treponematoses, penicillin sensitivity of treponemal strains received from various WHO field projects; the production and standardization of cardiolipin antigens, establishment of

standard test serums, the evaluation of antigens for the serodiagnosis of syphilis, and many other subjects of research. An internationally assisted project against endemic syphilis in Bosnia has yielded new and valuable epidemiological knowledge.

The International Salmonella and Escherichia Center in Copenhagen receives cultures for identification from all parts of the world and distributes cultures and diagnostic serums to national laboratories. The worldwide network of WHO Influenza Centers regularly examine strains of influenza virus from all countries and communicate valuable information on the types

of strains which have to be used at particular times and in particular places in the national production of vaccine.

The influenza epidemic in 1957 subjected this network to its most serious test since its inception in 1947. However, it successfully performed the functions for which it was designed with the result that further development seems justified. In just less than 3 weeks after WHO received the first news that a significant epidemic was occurring, the Organization was able to inform health authorities and vaccine-producing laboratories that the responsible virus was unrelated to all previously isolated strains and that existing vaccines were unlikely to give protection. The warning was given in time for several countries to prepare their health services to face the impending epidemic and, in some countries, significant quantities of vaccine were produced in time for use before the epidemic struck.

Because of the uncertain status of domestic animals in the epidemiology of human influenza, steps were taken early in last year's epidemic to have serum specimens collected from swine and horses in 25 countries before and after the human epidemic struck. These specimens are being examined at the WHO Influenza Centers and it is hoped that valuable information will be gained concerning the epidemiology of human influenza.

New Public Health Activities

The example of influenza shows that, even in regard to what we may call the old, traditional disease problems, it is the duty of WHO to keep pace with current scientific developments and progressively to modify its approach to specific disease problems in the light of both new discoveries and the changes which may occur in epidemiological conditions. In our struggle to achieve worldwide health and prosperity, there is no room for complacency. We must be constantly alert and ready to attack any new problem which arises.

Increasingly in the years to come emphasis will be laid on the importance of certain new health activities in which the Organization is being called upon to collaborate with govern-

ments, such as chronic diseases, occupational health, mental health, food and drug services, and the health aspects of nuclear energy. In discharging its responsibilities with regard to the health aspects of atomic energy the Organization greatly benefits from methods and techniques already evolved in other fields for the training of personnel, the dissemination of scientific information, and the stimulation and coordination of research. This experience has been carefully applied to the two main types of activity WHO is required to carry out in developing a program on health in relation to atomic energy: The first relates to the use of radioisotopes in medicine and public health; the second aims at the protection of populations against the risks of radiation. From the directives of the World Health Assembly it is clear that WHO is concerned only with the health aspects of the peaceful use of atomic energy.

Training, especially of personnel from countries new to atomic energy, is considered as one of the most important functions of WHO in this field. An initial step was taken in 1955 when the first international training course ever held on radiation protection in relation to atomic energy was organized by WHO. This was held in Stockholm with the cooperation of the Swedish Government and the United States Atomic Energy Commission, and in 1957 a similar course was given at Mol in Belgium, with the cooperation of the Belgian Government as well as with the USAEC. Both courses were attended by physicists and physicians specializing in radiation work from a number of European countries, while in the case of the Mol course representatives of some Eastern Mediterranean countries also took part. WHO has also arranged rather shorter courses for public health administrators at Saclay, France, and Harwell, England.

Activities last year included two expert committees convened for the general purpose of providing more detailed recommendations on the type of training which doctors and other health workers would require in a world in which the peaceful use of atomic energy and radiation in general is likely to take a progressively more important place. One of these

committees dealt with the introduction of radiation medicine into the undergraduate curriculum, the other with the subject of postgraduate training in the public health aspects of atomic energy.

Training of medical men in the use of radioisotopes in countries new to this application of science is a subject where WHO's system of international fellowships is particularly useful, both to introduce a fellow to the requisite techniques and to give him clinical experience. Long-term individual fellowships are also most useful in training medical men or scientists in radiobiology.

The interest of the World Health Organization in radiation and human genetics was shown by the convening in 1956 of a study group on the effect of radiation on human heredity, and the report of this group has been recently published. The genetic effect of radiation is of course one of the factors to be considered in the disposal of radioactive waste or in the possible effects on populations of the widespread

use of medical irradiation, and is therefore of direct concern to public health administrators.

The Future

During the first 10 years, the World Health Organization has fulfilled international tasks taken over from its predecessors; but it has also undertaken a program towards a healthier world beyond anything previously attempted. Together with other international agencies, WHO has helped reduce the gap that separates the people of the well-to-do countries from their less fortunate brethren. It has carried on and enriched the tradition of the universality and humanitarianism of medical science, and its modest achievements have at least shown some of the possibilities opening up for good and effective international health cooperation.

We realize, however, that much more is urgently needed before the whole world may enjoy the degree of health protection that is available to an increasing yet still far too small segment of mankind.

Manila Meeting on Social, Preventive Medicine Teaching

Deans of medical schools and professors of social and preventive medicine in Western Pacific countries met at the University of Manila during 2 weeks of October 1957 to discuss the teaching of social and preventive medicine to undergraduate students. Represented in the study group, which was sponsored by the World Health Organization, were Australia, Cambodia, China (Taiwan), Fiji, Hong Kong, Japan, New Zealand, Singapore, the Philippines, and Vietnam.

As stated by the group, social and preventive medicine courses should make students aware of social needs in medical services and of the role of social organization in the genesis, course, distribution, prevention, and treatment of disease.

Several recommendations emanated from the

conference: the teaching of social and preventive medicine, which must vary according to the country's needs, should have a practical approach. Courses should extend throughout the medical curriculum and retain some traditional public health material. In research, applied and fundamental studies should be balanced.

Advantage should be taken of opportunities to teach through local health centers, teaching hospitals, and other community resources.

The medical school should teach comprehensive health care by using existing services of the government or other agencies, and under some circumstances, by using their own health clinics.

A full report will be issued by the study group.

WHO

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to

CHILD HEALTH

JESSIE M. BIERMAN, M.D.

MARTHA M. ELIOT, M.D.

FROM THE TIME that the Technical Preparatory Committee established by the United Nations met in Paris in March 1946 to prepare a draft constitution for the World Health Organization, it was a foregone conclusion that one of the major purposes of the World Health Organization would be to promote the development of maternal and child health programs, with national agencies and with other international organizations cooperating to this

Dr. Bierman, who served as chief of the Maternal and Child Health Section of the World Health Organization in Geneva during 1956-57, is professor of maternal and child health, University of California School of Public Health. Dr. Eliot heads the maternal and child health department of the Harvard School of Public Health. She has served as assistant director-general of the World Health Organization and as chairman of its Expert Committee on Maternal and Child Health.



end. Two clauses in the proposals of that committee made this quite clear.

In the preamble, after defining health and setting forth a series of declarations with respect to the rights of individuals to health, the responsibilities of States and related truths, the preparatory committee proposed inclusion of the statement, "Healthy development of the child toward world citizenship is of paramount importance." This proposal both in the committee and on the floor was submitted as part of the draft constitution to the International Health Conference, held in New York in June and July 1946.

During the discussions at this conference this proposal became the subject of active debate in committee and in plenary sessions. As a result the words which were obviously subject to disagreement—"toward world citizenship"—were dropped, and, instead, a new phrase was substituted to express the primary intent of the original language, namely, that all children must develop the ability to live harmoniously with their neighbors and with all peoples throughout the world. Because of the importance of this concept to all the world today, it is desirable to state here the language as it was finally adopted by the International Health Conference and made a permanent part of the constitution of the World Health Organization. The sixth clause of the preamble says: "Healthy development of the child is of basic importance; the ability to live harmoniously in a changing total environment is essential to such development." Fortunately, also, since preambles are sometimes thought of as aspirations only, the framers of the constitution included in the list of functions of the Organization the same concept in words calling for action. Here the words are: "To promote maternal and child health and welfare and to foster the ability to live harmoniously in a changing total environment."

It should be remembered that this constitution was adopted in July 1946, only a few months after the first atomic bomb had been dropped on Hiroshima. In presenting arguments for the adoption of this reworded clause for the preamble, Dr. Brock Chisholm, the delegate from Canada, pointed out the complete change in the situation in the previous 2 years.

Dr. Chisholm went on to say: "The environment of every person in the world now is the whole world; and it is essential to the health of every individual that he develop beyond the capacity to live with his own kind of people in his own little environment and be able to live with all kinds of people all over the world."

He continued: "This is not a social or an educational concept. It is a health concept, because no person who is incapable of doing this will in the future be able to live at peace with himself—because over the radio, through newspapers, by movies, he is brought into immediate contact with everything that goes on all over the world, and he must be able to live in harmony with these things in order that he may not suffer the results of frustration of his own gregarious instinct. . . . It has been necessary for every organism to be able to change and adjust to a changing environment throughout all time. If man proves unable to make this adjustment, he will follow the dinosaur into oblivion and will become completely obsolete."

When he supported Dr. Chisholm's proposed new wording, as indeed many delegates did, Dr. Frank Bondreau, speaking for the United States, expressed the hope "that the World Health Organization would undertake as soon as possible a program of work designed to achieve its objective."

It was with this as a frame of reference, then, that the work of WHO in the field of maternal and child health got started. The first steps were taken by the Interim Commission, which had been established to act until enough countries ratified the new constitution to bring the World Health Organization itself into existence. The first proposals were to pick up the type of activity that had been carried out by the Health Organization of the League of Nations, namely, studies of infant mortality.

However, by January 1948, before these studies could be begun, more comprehensive proposals for a new maternal and child health program to be undertaken by the World Health Organization were already under consideration at the fifth session of the Interim Commission in anticipation of the First World Health Assembly which was expected to be held the following June. Substantial interest had been growing among members of the commission in

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A Turkish mother soon to have her ninth child is shown here receiving prenatal care for the first time. Set up with the help of WHO and UNICEF, the mother and child center in Ankara is now carried on by the national staff.

In July 1948 the First World Health Assembly, recognizing that certain difficulties in the relationships between the two organizations had arisen and might continue unless a framework for appropriate and continuous cooperative action were set up, recommended the establishment of a Joint Committee on Health Policy to be composed of members of the executive boards of the two organizations. Later in the same month these executive boards, meeting simultaneously in Geneva, Switzerland, adopted essentially similar resolutions creating the Joint Committee on Health Policy of the two organizations.

In brief, the functions of this committee are to approve all health programs through which

UNICEF proposes to meet the requests of countries for assistance and to review these programs from time to time with a view to their evaluation. The committee also assures that the organizations are continuing to work cooperatively to the end that children the world over will receive the best health care possible under the circumstances in the country seeking help. The health programs that have been approved for joint projects fall into three groups: (a) mass health campaigns, such as those for control or eradication of malaria, tuberculosis, yaws and other treponematoses, trachoma, and leprosy; (b) maternal and child health (or welfare) programs, including establishing, equipping, and providing supplies for

a program of maternal and child health that would be more in keeping with the intent of the constitution and that would lay the ground for cooperation with many countries.

By January 1948, it had also become clear that the World Health Organization would have an increasing responsibility to provide the professional and technical help required by United Nations International Children's Emergency Fund in connection with its programs in the child health field. A comprehensive plan for the development of a maternal and child health program (1) over the next few years was therefore laid before the Interim Commission. Its warm reception resulted in maternal and child health being placed in the priority list of recommendations for program action second only to malaria, which was well known to be the world's greatest killer. In the introduction to its proposal, the Interim Commission said:

"An international programme for maternal and child health is recommended in view of the high incidence of preventable deaths among infants and mothers in large areas of the world; the effectiveness of available techniques in reducing mortality and improving the health of infants and mothers; the immediate and continuing need, for the protection of coming generations, of scientific guidance in the utilization of available foodstuffs; the high incidence of communicable and other preventable diseases among children; the widespread mental and emotional maladjustment and insecurity among children and youth; the insufficient understanding and knowledge among parents and others of the causes of ill-health and abnormal behavior of children; and the effects of economic and social changes on the physical, mental and emotional development of children."

The objectives of the proposed program were:

"To assist governments in developing services and facilities that will assure adequate maternity care, the best possible chance of survival to infants, and to all children normal physical growth and development, mental and emotional health, and freedom from preventable diseases; to pool knowledge, acquire new facts, develop standards of care, and distribute information in respect of all relevant matters; and

to cooperate with other agencies on joint undertakings which apply knowledge and techniques in the fields of social and biological sciences and of education to problems of maternity and childhood."

The commission recommended the establishment of a section on maternal and child health as a part of the WHO Secretariat, the establishment of an expert advisory committee on maternal and child health, and the employment of individual experts and teams on a temporary basis as required.

The First World Health Assembly, when adopting in July 1948 its program for the first year's work, included maternal and child health among the four top priority programs, and instructed its executive board to take the steps necessary to implement the commission's recommendations. The story of the work for children done by this and other sections of WHO is described later.

Reference must be made here, however, to the establishment of UNICEF and to the effective collaboration that gradually developed between the Fund and WHO, particularly with the Maternal and Child Health Section. Fortunately for the world's children the General Assembly of the United Nations decided in December 1946 to create a fund to which governments and people would contribute voluntarily for assisting children in war-devastated countries with food, clothing, and medical supplies, for training personnel, and for child health purposes generally. That this new organization must necessarily collaborate with WHO and other appropriate specialized agencies of the United Nations was foreseen by the General Assembly.

The resolution under which UNICEF was established provided that the Fund should be primarily responsible for making available equipment and supplies and for assisting with training, but that it should look to the specialized agencies, especially to WHO, for the technical help and assistance required by countries seeking assistance for the development of their child health and welfare programs. It became necessary very early for these organizations to develop methods of cooperation that would assure satisfactory relations with governments and with each other.

more developed countries a hundred or more years ago. The principal child health problems are the result of undernutrition and malnutrition combined with an endless procession of infectious and parasitic diseases. Underlying these are poverty and ignorance and a generally unsanitary environment.

MCH Assistance Matches Development

There has been no uniform plan of MCH assistance. In countries with minimal educational and health facilities, few professional health workers, and high prevalence of endemic and communicable diseases, the mass disease control campaigns have had high priority in the beginning. The first MCH assistance has often centered about improvement of any existing, voluntary services. This is followed by the establishment of training facilities for auxiliary MCH workers; simple measures for improving the services of traditional birth attendants, or untrained midwives; and extension of preventive services, especially in maternity care, to new areas as personnel are trained. Fellowships for study abroad have provided a nucleus of professionally qualified doctors, nurses, and midwives. Then, as rapidly as possible, training schools for professional nurses and midwives are established.

A later phase of assistance is the planning and establishment of a permanent health organization to consolidate the gains made in the mass campaigns and to provide a framework for the extension of preventive and curative services and health education. It is in this stage that maternal and child health has made a great contribution to general public health, for it is commonly the first of the permanent preventive health services and forms a nucleus around which general community health programs can be built. In the region of the Americas, emphasis has been on strengthening MCH services as a component part of general health projects.

In the majority of assisted countries at present, basic minimal services are being extended to rural populations as rapidly as possible, and at the same time professional training is being stepped up so as to provide more adequate numbers of professional personnel for super-

vision of the ever-increasing numbers of local centers and for leadership within the countries.

A small group of the assisted countries, such as Austria, Italy, and Spain, have achieved virtually full coverage of the population by basic health services including maternal and child health. Their infant and maternal mortality rates are relatively low. In these, the requests for assistance are in connection with the development of services for prematurely born infants, the rehabilitation of physically handicapped children, the prevention of childhood accidents, and in the promotion of mental health. The assistance has been in the form of travel fellowships, seminars and inservice training courses, short-term services of experts, and the provision of equipment necessary for establishing programs in these special fields.

Between 1947 and 1956, some 600 WHO fellowships were awarded for study abroad of various aspects of maternal and child health. The majority have been awarded to physicians, but nurses, midwives, and a few other categories have been included. The fellows came from 44 countries and territories and studied in 27 different countries.

International personnel have been assigned to 34 countries to assist the governments in establishing or improving their own training institutions for nurses or midwives. And medical schools in 10 countries have had help in establishing or upgrading departments of pediatrics. Assistance in pediatric education can be expected to increase as the UNICEF Executive Board has recently approved the extension of its assistance to medical schools for the training of physicians in pediatrics and preventive medicine. The first of these joint WHO and UNICEF projects is the one at the University of Madras, India. The pediatric department is envisaged as a focal point for the teaching of pediatrics to nurses and midwives as well as physicians, for continuation education for MCH field personnel, for graduate training of pediatrics instructors and for research on the important child health problems of the country.

Assistance has also been given to the All India Institute of Hygiene and Public Health in Calcutta where an MCH unit has been es-

maternal and child health centers, training personnel for this type of work, and providing personnel for demonstrations of newer methods of health work with mothers and children; and (c) certain of the food conservation programs, which are carried out largely in collaboration with the Food and Agriculture Organization of the United Nations.

In the past 10 years of their collaboration, these two great international organizations have assisted in the development of many different types of programs that affect the health and well-being of millions of children and mothers in many parts of the world.

Broad Scope of MCH Programs

The mass campaigns against the major communicable diseases and programs to improve the sanitation of the environment are of basic importance to the health of children. But much more is required than the stalling of epidemics. To achieve the stated objectives, it is necessary to reach and to serve the individual child and his family on a continuing basis. This requires some kind of permanent organization in the field and large numbers of trained personnel. At best, this is a painstaking and costly process and it takes time, not only to train personnel but to build services and to gain acceptance and cooperation of the people served. To be most effective MCH services need to be an integral part of general health and medical services of the community, and in many areas of the world such services are in the very early steps of development or are still nonexistent.

During the earlier years, many maternal and child health centers were established on too specialized a basis in advance of general public health development. But there is now increasing recognition that in the developing countries, maternal and child health should not be considered so much a specialty as a medium through which general health measures can reach two large groups in the population having certain special needs in addition to those shared by all. Children under 15 years of age and women of childbearing age constitute between 60 and 65 percent of the population in most of the assisted countries. Because of the prevalence of endemic diseases and malnutri-

tion, purely preventive services focused primarily on the reproductive and growth processes are neither possible nor desirable. But the thousands of MCH centers which have been established as a result of WHO and UNICEF assistance offer unequalled opportunities to combine preventive and simple curative services with health education and provide focal points for activities in home sanitation, nutrition, and communicable disease control for families.

The amount of funds and the size of the staff in the WHO Secretariat entrusted with this gigantic responsibility have been very small. Positions have been provided for two MCH physicians at headquarters and in the vast region of Southeast Asia and one in each of the remaining five regions. In 1956 approximately 11 percent of WHO and UN technical assistance funds expended in the assisted countries were specifically earmarked for maternal and child health (2). Maternal and child health, nursing, including midwifery, and nutrition services combined account for roughly one-fourth of the funds expended in the assisted countries, or about \$1.6 million. During this same year, UNICEF assistance to the building of permanent services in the MCH field amounted to \$3.4 million, or about 18 percent of the program allocations (3).

As previously noted, most of the assistance in maternal and child health is of a joint nature with WHO responsible for providing professional staff and technical guidance and fellowships for professional training and UNICEF the necessary equipment, supplies, transport, and training stipends for local auxiliary personnel. In terms of funds then, the assistance from the two agencies has amounted to less than \$5 million a year, but it must be borne in mind that the assisted countries have expended far more than this as their share of the cooperative effort.

What follows is an account of some of the contributions which WHO and UNICEF have been able to make in assisting governments of some 50 countries in the development of health services for mothers and children. In these countries live above one-half of the children of the world. The vast majority of them live in areas where the infant and childhood mortality rates are at levels which prevailed in the



In the fight against infant mortality, WHO-trained public health nurses score their first victories when they establish confidence and cooperation. Here, such a public health nurse visits a family living in Chorrera, Panama.

gated to it by member governments and the United Nations. These include coordinating and regulatory functions; collection and distribution of information; pooling of health knowledge, skills, and resources of member countries; and conducting investigations. For want of better terms, these are often referred to as central technical and advisory services. Many of the services rendered by the various headquarters sections make important contributions to maternal and child health. Among them are the statistical services, studies and surveys of nutritional problems and of specific diseases affecting children, mental health, and health education.

Among the chief functions of the MCH Section are the servicing of the expert panel and expert committees in maternal and child health,

the convening of study groups, the conduct of surveys and studies, the development of long-range plans for the MCH program of the organization, and cooperating with other United Nations agencies and with nongovernmental organizations concerned with international programs for children.

There are at present 42 experts from 20 countries on the MCH panel. They include leading authorities in such special fields as prematurity, nutrition, mental and school health, rehabilitation, pediatric and obstetric education, and MCH administration. Other expert panels, such as those in nutrition, mental health, and nursing, also deal with problems of concern to MCH. Through the panel system, the organization has at its command a great wealth of knowledge and skills which it is able to call

tablished to provide graduate training in MCH for physicians and nurses, with emphasis on the child health aspects. The institute is now training students from a number of countries in Asia. Continued progress will demand more opportunities of this kind for MCH physicians to receive training in general public health and the administrative aspects of MCH as well as in obstetrics and pediatrics.

Service and training functions are combined in the MCH demonstration and training projects, 40 of which have been established in 29 countries. In these, WHO has provided a team consisting of an MCH medical officer and usually one or more public health nurses and midwives. The team works with personnel provided by the government. They establish an MCH unit to demonstrate services appropriate for the area and to provide training for auxiliary MCH workers and orientation and refresher courses for professional personnel.

In many of the countries the great majority of deliveries are attended by untrained traditional birth attendants. Training programs have been established in several countries with WHO-UNICEF assistance to bring about a much needed improvement in the practice of these attendants, the program in the Philippines being to date the most extensive and successful. More than half of the estimated 6,000 attendants have had some training.

An essential feature of all of these training plans is that government counterparts work closely with the international personnel and carry on after the withdrawal of the latter which takes place after 2 to 4 years. The physicians, nurses, and midwives who have been assigned by WHO to these training projects have come from all parts of the world. An MCH team working in India may have a physician from Mexico, a nurse from New Zealand, and a midwife from Sweden. While in the early years, the personnel were recruited principally from the United Kingdom, northern Europe, and North America, many other countries are now able to provide personnel with the requisite training and experience to serve in these posts, adding substantially to the international character of the programs.

There can be no question but that international aid has given a tremendous stimulus to

the training of health workers—1,500 nurses and more than 2,000 midwives in a year's time in India; 650 midwives in Korea; 69 health visitors in Syria; the first class of 11 community midwives graduated in Libya; and 10,000 rural auxiliary nurse midwives in Turkey by 1970. A large number of new training schools and field training units have been established. The enrollments for both professional and auxiliary workers have greatly risen, and refresher courses and inservice training programs are increasing. Educational standards for the professions have been raised. The status of nursing as a career for women has improved. And as a result of the increased numbers of professional and auxiliary health workers, it has been possible to establish thousands of new centers in areas where MCH services have never before been available.

Growth of National MCH Units

A central purpose of all WHO assistance is the strengthening of national health administrations. An evidence of progress in this respect, as well as increasing recognition of the importance of maternal and child health, is the creation of MCH units in national health administrations. Twenty-eight of the 53 governments which have had maternal and child health assistance from WHO have established such units or have plans to do so shortly. Twelve of these have been established within the past 5 years.

The functions of the units vary widely, as do the number and qualifications of the personnel. In many instances, the staff consists of *only one* medical officer, who serves as adviser to the national administration and has certain limited administrative functions. In several Asian and Latin American countries the staff is larger and is able to assume responsibilities for program development and to provide technical supervision of MCH activities.

There are a few countries now in which well-qualified public health workers are not being fully utilized because the governments have been unable to establish the positions for which the personnel were trained.

In addition to direct assistance to governments, WHO has other responsibilities dele-

practices; the influence of long-established traditional child-rearing practices on mental health; and the effects on mental health of the profound changes in every aspect of life which are resulting from rapid technical development.

As international activities increase, the need for coordination of efforts grows. This has been particularly true for the several United Nations agencies, most of which serve children in some way. Excellent cooperative relationships have developed among agencies working on common projects as exemplified by the WHO-UNICEF partnership in MCH assistance programs, WHO-UNICEF-FAO collaboration in nutrition projects, and the WHO-UNESCO study of teacher education in health.

Several nongovernmental international agencies interested in MCH are affiliated with WHO, an arrangement which facilitates cooperative relationships and endeavors. The joint sponsorship of the survey of pediatric education with the International Pediatric Association and the close relationship with the International Union for Child Welfare are examples. In time, it is likely that these coordination functions will become increasingly important.

Never before have opportunities been afforded health workers from most of the countries of the world to meet together, to talk over common problems, to share experiences, to learn from one another, and to arrive at agreements on common goals. In the course of a year there are innumerable opportunities for such interchange offered under WHO auspices—from the World Health Assembly itself and the associated technical discussions involving persons from all member countries, to small seminars and inservice training sessions for local health workers within the countries.

A better understanding of the nature of the health needs of mothers and children and of methods for dealing with problems give administrators courage to deal with the many obstacles in the way. Leaders in MCH benefit from opportunities to keep up to date and to grow in confidence and in professional competence. And for staff workers, confronted every day with sick, malnourished mothers and children, with inadequate funds and staff, and often with little community appreciation or un-

derstanding of their work, the opportunity to meet occasionally with confreres with similar interests and problems provides much needed encouragement and refreshment. It may well be that the widespread opportunities being afforded for the exchange of ideas will, in the long run, prove to be a greater force in the solution of the world's health problems than advice from experts and supplies and equipment.

It appears justifiable to conclude that substantial contributions to child health have been made during the first 10 years of the existence of WHO and UNICEF. While in most of the assisted countries, only a bare beginning has been made toward reaching the objectives set forth by the Interim Commission, it is, nevertheless, a sound beginning. In order that children can learn to "live harmoniously" in their environment, it is necessary first that they live. It is understandable then, that the major effort in a large part of the world has been directed to this end and to laying the groundwork upon which—as time and resources permit—can be built those services which will promote the health of children in the broadest sense.

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on at all times for advice and assistance in the determination of policy and on specific matters.

From time to time expert committees of panel members and less formal study groups are convened to study and make recommendations on specific topics. This process of synthesizing existing knowledge on leading problems and making the results widely available through technical reports is a contribution of great importance. A list of subjects most directly bearing on MCH will serve to indicate the broad scope of the problems which have been considered to date (the numbers represent the WHO Technical Report Series designation): maternity care (51), midwifery training (93), prematurity (27), immunization (6, 61), nutrition (41, 72, 97), mental health (70, 75), physically handicapped (58), epilepsy (130), school health (30), MCH administration (115), childhood accidents (118), and pediatric education (119). Many other reports, particularly those dealing with specific diseases affecting children, have also made important contributions to child health.

Several monographs in the MCH field have reported on studies carried out, in various parts of the world, on behalf of WHO (4-8).

In addition to the influence of the published reports, the bringing together of experts and research workers from various parts of the world has had a great influence in focusing attention on unsolved problems, in stimulating research, and in advancing knowledge more rapidly than has heretofore been possible. A good example is the rapidity with which knowledge has accumulated concerning protein malnutrition in children since 1949. Through a combination of WHO-FAO Joint Expert Committee meetings, field surveys, and the bringing together of research workers from all parts of the world under the auspices of the Josiah Macy, Jr., Foundation, protein malnutrition has come to be recognized within a very few years as one of the most widespread public health problems in the world.

WHO has sponsored two surveys of pediatric education, one in Latin America and the other in the countries of western Europe. The latter was carried out under the auspices of the International Pediatric Association. The convening of a study group on pediatric education in

1956 followed the completion of the surveys. These efforts are part of long-range plans to bring about improvements in pediatric education.

Two reviews of WHO-UNICEF assistance in maternal and child health have been carried out by the staff. The last one was presented to the Joint WHO-UNICEF Committee on Health Policy in 1957 (5). The committee has requested that reviews of certain aspects of the assistance program be presented every other year, thus establishing a pattern of continuing evaluation. If properly supported and well conducted, these evaluation studies will have great influence in guiding the two agencies and the assisted governments as well. This is but one evidence of the growing recognition on the part of both WHO and UNICEF of the need for evaluation of the programs which have grown so rapidly in the past few years.

Long-range plans have been developed for studying a number of MCH problems of worldwide significance. Included are the diarrheal diseases which account for the largest number of deaths of infants and young children in most of the developing countries. The epidemiological, clinical, and bacteriological aspects will be studied with a view to defining more clearly the environmental and host factors which must be considered for practical control in the assisted countries. In the region of the Americas, technical discussions and country seminars on diarrheal diseases have been held and field studies are under way to determine the feasibility of teaching auxiliary field workers techniques of combating dehydration, the immediate cause of death in infant diarrheal infections.

Other studies under way are concerned with a reevaluation of present criteria for prematurity, practical approaches to school health in developing countries, methods for strengthening nutrition services in MCH programs, and methods for improving the preparation of midwives for services to children.

The incomparable opportunities for research in the international aspects of MCH have so far been little exploited by WHO. A few subjects which suggest themselves are the differences in growth and development patterns of children in areas with different child feeding and rearing

statistical nature that have a bearing on the progress of nursing, but of more importance are certain events with significant implications which more clearly mark the progress of nursing in the past decade.

Nurses Recognized As Essential

Of a tangible nature is the establishment of the World Health Organization and the technical assistance programs of the United States Government and of the Colombo Plan, to mention a few. These are things we see and read about and provide funds for. There is, however, one tremendously important but intangible event that, in my opinion, constitutes the most significant development in nursing. This needed no treaties, no funds, no agreements—it simply happened because it was inevitable. It is the recognition of the essentiality of nursing in providing health services for the people of the world. To be sure, we have always said that nurses were needed in hospitals, in public health programs, in industry, and in other areas. But only recently has the nurse been recognized as essential in the development of adequate health services if the peoples of the world are to be served adequately. There is considerable evidence to support this now accepted fact.

We know that the development of nursing in any country is limited to a great extent by the state of development of that nation's medicine and public health. However, as the World Health Organization Expert Committee on Nursing has stated, in countries where medicine is highly developed and nursing is not, the health status of the people does not reflect the advanced stage of medicine. Nursing, therefore, becomes essential to the vitalization of any health program.

In 1948, at the meetings of the First World Health Assembly, only one country included a nurse as a member of its delegation. Eight years later at meetings of the same agency, 20 countries sent a nurse as a member of the delegation. This is a momentous change and a challenge to nursing.

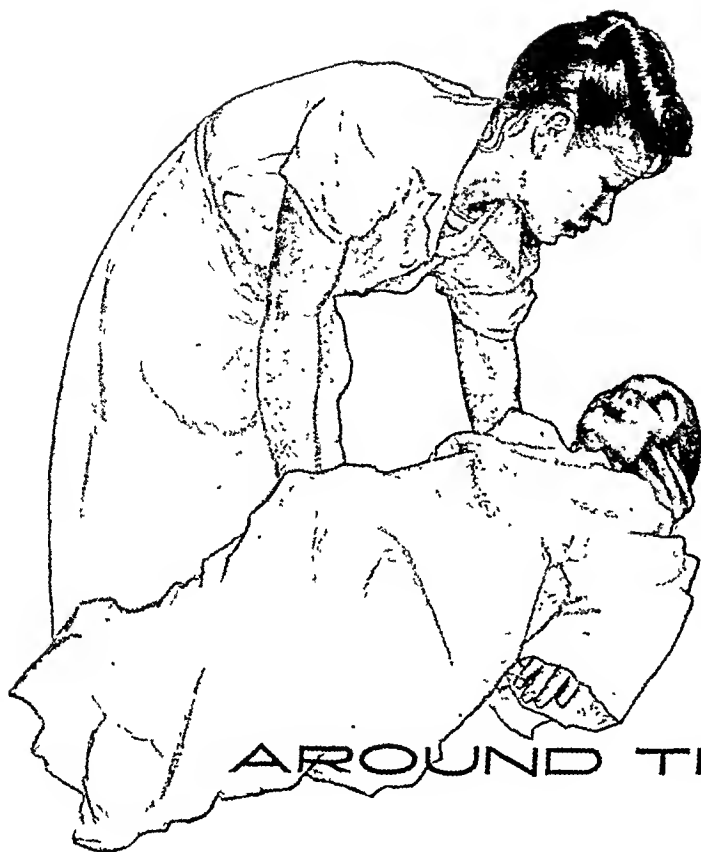
In 1949 the United States included a nurse as one of the three advisers to the United States

delegation to the meetings of the United Nations Commission on the Status of Women, held in Beirut, Lebanon. Since those meetings, whenever the agenda of the United Nations Commission on the Status of Women included items on the health of mothers and children, either a nurse has been a member of the United States delegation or a nurse's advice on agenda items was sought. The United Nations Commission on the Status of Women has also given support to nursing in member countries.

At the Ninth World Health Assembly in 1957 the theme of the technical discussions was "Nurses: Their Education and Their Role in the Health Programs." Preliminary reports on which these discussions were based were received from 33 countries, and all members of each country's health team participated in the preparation of the papers and in the discussions. From the many significant statements in the final report of these discussions, one or two will suffice as evidence of the essential role of the nurse. One statement says that "all countries recognize the need for post-basic study for graduate nurses so that they are prepared to hold positions as nursing administrators, supervisors of nursing services, teachers in schools of nursing and for certain clinical specialties." In other words, it is recognized that nurses can and must assume the responsibilities for nursing.

Another entire section deals with conditions which limit the effectiveness of nursing service in the health program. It is significant that the member countries recognized the need to study those conditions that detract from the concept of the essentiality of nurses and those that can be changed.

In May 1957 the International Council of Nurses held its Eleventh Quadrennial Congress in Rome. This is really not an unusual event, since these congresses are usually held every 4 years. But it is important that 9 new countries were admitted to full membership and 5 countries were admitted as associate members. Thus nursing representatives of 51 countries gathered to share experiences and to speak for nursing. At this congress the report of the WHO technical discussions of 1957 was cited constantly as an authoritative source, and many



NURSING

AROUND THE WORLD

VIRGINIA ARNOLD, R.N.

PEOPLES throughout the world are waking up to the fact that good health is their right, and their demands for wider and improved health services have shaken us out of our complacency and have forced changes in outmoded systems of health services. Nursing has been caught up, too, in this demand for better care. Much of the progress in nursing

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in the past 10 years has been effected by the nurses themselves, but no small part is due to the demands and the push from society.

How can the progress of nursing be demonstrated and evaluated? Would it give you a true picture if I listed the newly established schools of nursing in the Middle East, the Far East, and in Latin America? Would it help you to know that many more girls are entering nursing than at any other time in history? Would the picture be clearer if you knew that more nurses' associations have become members of the International Council of Nurses? I could describe other items of a more or less



The baby helps train Greek student nurses to become "substitute mothers."

with Syrian nurses in the key positions. And in Egypt, a school of nursing has been established in the University of Alexandria.

The countries in the Far East are also moving ahead in the development of nursing. Taiwan has started a university school. Japan is pushing vigorously ahead. India is leading the way in many respects. And the gentle Vietnamese, in whose country nursing education was nothing more than an apprenticeship a few years ago, are increasing their 2-year course to 3 years, and Vietnamese nurses are directors of two branches of the National School of Nursing located in Saigon and Hue.

Developing Professional Role

If we consider regions, rather than individual countries, we can certainly say that Latin America has advanced more rapidly than any other region of the world. Last year, the Brazilian nurses realized that they knew too little

about their professional situation and felt that nursing was at a stage of development where they must decide which road it would follow. So the Brazilian Nurses' Association undertook a survey of the nursing resources of the entire country. This important survey will be completed in June 1958. Considerable useful and revealing data have come from this survey already. Other countries are beginning to look at their own nursing resources more carefully as a result of the Brazilian study.

Another significant mark of progress in Latin America is the thorough scrutiny of curriculums which is now going on in many schools of nursing. Formerly, the better schools quite clearly reflected British or American patterns and influences. But in recent years the conviction is growing that these are not good enough because they do not prepare the nurses adequately for the health problems peculiar to their own areas. As an example, courses in teaching and supervision are being introduced in the third year



Visiting nurse aide explains simple rules of health to a family in Brazil.

were the reports of changes based on the recommendations in the WHO report.

Growing Responsibilities

And, with regard to the matter of nurses' speaking for themselves, in many countries a nurse has been appointed to a position of responsibility in the Ministry of Health. In two countries, Sweden and Finland, nurses are members of parliament.

Let's look at the Middle East for a moment and note some of the changes in that part of the world.

The School of Nursing of the American University of Beirut inaugurated a postgraduate course in public health nursing in 1954. The graduates of this course have already influenced public health nursing practices in the surrounding Arab countries. But, in Iran in 1951 nursing was in a sad state. The quality of nursing education was poor; services were lacking or

inadequate; and the midwife enjoyed a prestige far beyond that of the nurse. In the past 2 years, there have been some notable changes, demonstrated most dramatically by the shift in status of the midwife vis-a-vis the nurse. Now midwives are asking for the opportunity to obtain their basic nursing training so that they can compete more favorably with nurses and nurse-midwives. In 1956, Iran held its first nationwide conference on nursing, inviting to it internationally known leaders in nursing. At this conference, for the first time, the Iranian nurses took a good look at their professional position and, as a result, drew up plans for legislation, educational standards, and organization of nursing services.

In Jordan, within a period of 6 months, the right to vote was granted to certain women; the first national conference on nursing was held, and the Jordanian Nurses' Association was formed. In Damascus, the school of nursing in the university is moving ahead steadily,

Lest I mistakenly leave you with the impression that nurses alone have brought about all these changes, I shall mention a few other forces and factors that have played an important role. Among these are the spread of the emancipation of women, the expanded educational opportunities for girls, the number of girls receiving advanced schooling, the creation of new nations with their developing health services, the tremendous cultural and sociological changes in some areas of the world, the great ease of com-

munication which facilitates the exchange of ideas, the dramatic technical and scientific advances, and the pressures brought to bear by the masses for improved health services. In this complex and changing world, particularly in the East, women today in different degrees are playing a vital part, no longer content to be merely bystanders and recipients of the benefits of change, but demanding that they be allowed to work creatively in their own environment to help form a new society.

Perinatal Mortality Conference

If avoidable perinatal mortality is to be reduced, a new philosophy and a new approach to the education of doctors, nurses, and patients are needed. This was the consensus of a conference followup of the New York Academy of Medicine's 1955 study of mortality among infants from the 20th week of gestation through the 6th day after birth.

The conference at the Academy on October 29, 1957, was sponsored by official and voluntary agencies and representatives of the medical profession. Specialists in obstetrics, pathology, anesthesiology, nursing, hospital administration, social work, preventive medicine, and public health education participated.

Group discussions of questions raised by the study of 955 perinatal deaths in New York City led to recommendations for improving maternity care and reducing infant deaths.

Prematurity, the cause of two-thirds of perinatal mortality, could be lowered by strengthening prenatal care; prescribing nutritional supplements according to the mother's needs, just as medication is prescribed; doing more social case work among expectant mothers; avoiding meddlesome obstetrics and elective inductions of labor; and prohibiting active physical work for women with small heart volume and low hemoglobin. The conferees

also pointed out that prematurity is expensive; in a municipal hospital the care of a premature baby costs \$360, a full-term infant, \$100.

The specialists listed what hospitals and maternity clinics can do to reduce perinatal mortality.

They recommended that hospitals should emphasize the needs of people as much as the acquisition of skills in teaching interns and house physicians; provide 24-hour supervision with the supervisors aware of the background of each patient in labor; encourage mothers, once they return home, to telephone for advice; assign a staff member to answer their calls; and discuss current perinatal mortality regularly at staff meetings.

They also said that hospital maternity clinics should be encouraged to use more social workers and nurses trained in midwifery; set up appointments to reduce patients' waiting time, and use waiting time in the clinic for prenatal education.

The conferees further suggested that information about childbearing be made part of every young person's education and urged more research in habitual abortion, endocrine imbalance, physiology of the uterus, and physiology and function of the placenta.



Giving typhoid immunizations is part of this student's course in public health nursing at American University of Beirut, Lebanon.

because the graduates, however young and inexperienced, are called on to assume positions of responsibility in teaching and supervision. This situation will probably remain unchanged for some time to come.

In many countries, midwifery, including maternal and child health, and basic nursing are still separate professions. This concept is now changing with the recognition of the importance of midwifery and maternal and child care as a part of the education of the nurse.

Another significant improvement is reflected in the marked increase in the number of articles on nursing written by Latin American nurses, and in their growing interest in the writing of nursing textbooks. Such textbooks, made available in Spanish for all nurses, will release them from dependence on translations of Eng-

lish and American textbooks, which may or may not apply to their situations.

The nursing profession is becoming interested and actively engaged in various aspects of research. Last year, the Florence Nightingale International Foundation held a 2-week seminar on research at Sévres, France, the first of its kind. Representatives of 20 countries participated, each reporting on some special study going on in her own land.

The International Labor Organization, a specialized agency of the United Nations, has undertaken a worldwide study of the employment and working conditions of nurses. The ILO states that the objective of the study is "to obtain the fullest possible information on the social and economic status of nurses throughout the world."

training courses for midwife aides. It is a well-conceived program which is gradually expanding to serve the needs of the people and to become a training center for the area.

The men's hospital is a 60-bed facility for which the provincial health officer is gradually acquiring improved equipment. Some of the new equipment has been acquired from the United Nations Children's Fund. In the outpatient department, emphasis is placed on preventive medicine, particularly venereal disease control.

Venereal disease rates of prevalence have been comparatively low in Afghanistan. Nevertheless a program to control these diseases was one of the first modern public health activities to be undertaken by the government. In Kandahar it is under the direction of an Afghan physician who received training at Johns Hopkins University under a WHO fellowship. Treatment schedules are modern, utilizing penicillin procaine with aluminum monostearate, and the control program includes case-holding activities, mass blood testing, contact tracing, and education.

Associated with the two hospitals in Kandahar is a well-equipped X-ray institute under the direction of an alert, energetic doctor. It contains equipment also for taking electrocardiograms and measuring basal metabolism.

To Kabul

From Kandahar to Kabul (pronunciation rhymes with gobble), we flew over valleys between rugged mountains. In the valleys are occasional patches of irrigated fields and a few towns. One of the towns is Ghazni, which many centuries ago was the cultural center of this part of the world. We also saw evidence of many of the underground channels which in Afghanistan are called *karez* and in Iran, *ghanats*. From the air, they look like rows of doughnuts. Each "doughnut" represents a place where the dirt from the underground channel has been brought to the surface. The *karez* are the means by which ground water from the bases of the hills and mountains is channeled with a minimum of evaporation to the fields and villages where it is used.

After the bumpy trip over the mountains,

we arrived in Kabul, which is another city undergoing the process of modernization. The most obvious evidence of this is the streets, which a few years ago were bumpy and rutted and which now the government, with Russian assistance, is paving.

Here, as in Kandahar, the air of change is reflected in the medical and public health institutions and facilities. Under the guidance of a Minister of Health who obtained his medical and public health education in American schools, and with the assistance of WHO and UNICEF, the government is emphasizing solution of the basic problems of sanitation, hygiene, and preventive medicine.

The People

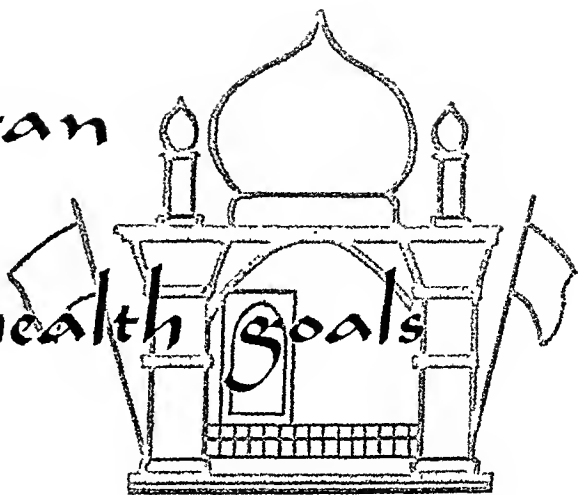
The inhabitants of Afghanistan are a mixture of people of Mongolian, Aryan, and Semitic origins. The so-called "true" Afghans speak Pashto (pronounced pushtoo). The men of this group are usually tall and broad shouldered with straight noses, regular features, and rather dark complexions, although some are fair, claiming descent from the Greek legions of Alexander and the ancient tribes of Israel. The group belongs to the Pathan tribes and is dominant ethnically. One of these, the Durani tribe, numbering less than 1¼ million people, has been the ruling faction for the last 200 years.

In a broad band along the Russian border and the Oxus River are the Turkomans of Mongolotartar origin, differing from the rest of the population by their Turkish dialect, dress, and the shape of the tents used by their nomadic members. They are herdsman and breeders of karakul sheep. South of the Turkomans, in the center of the country, are found the Hazaris, of Mongolian origin, descendants of Genghis Khan's followers. They speak Persian and related dialects.

In a small pocket in the east central area are the Uzbeks, a fair-skinned people with Mongoloid features belonging to the Turki-speaking tribes. Along the Iranian border are isolated groups of Tajeks, who are racially Persians but who resemble the "true" Afghans. They tend more to engage in industrial pursuits than do other Afghans, those living in towns forming

Afghanistan

charts health goals



GLENN S. USHER, M.D., M.P.H.

Afghanistan is a newly emerging nation of the free world which in recent years has accelerated the development of its resources. The government recognizes that its greatest resource is its people, and is striving to improve their health and well being.

In the spring of 1957 the Minister of Health of Afghanistan requested the International Cooperation Administration to provide consultation relative to the expansion of the country's health program with ICA's assistance. Accordingly, at ICA's request I visited Afghanistan in July and August of that year.

FROM KARACHI, Pakistan, to Kandahar, Afghanistan, the plane flies over a vast expanse of eroded hills almost devoid of human habitation. Then suddenly an oasis of irrigated fields appears below. This is Kandahar, the first stop in Afghanistan.

Kandahar gives the impression of being a city of unfinished buildings. One drives through long rows of them in various stages of construction, mute evidence of plans afoot to make Kandahar a major air terminus.

In the hospitals also there is an air of anticipated change. There are 2, 1 for men and 1

for women. While a new women's hospital is being constructed, female patients occupy the residence of a king who ruled 100 years ago. As it is a relatively new thing here for women to seek hospitalization, only a few beds for inpatients are provided in this temporary facility.

For the present, the health services of Afghanistan emphasize preventive medicine and maternal and child health activities. With the help of a physician and two nurses provided by the World Health Organization (only the two nurses remain), the Afghan provincial medical officer and his staff have organized prenatal and postnatal clinics, pediatric and well-baby clinics, mothers' demonstration classes, a domiciliary midwifery program, and

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Kabul, 15 provincial, and 15 small district hospitals, with a total capacity of some 1,400 beds (1). Separate hospitals are maintained for men and for women. Under the government's 5-year plan, funds have been allocated with which to build additional hospitals and to provide better facilities and modern equipment for the existing ones. In this building program, emphasis will be placed on providing more hospital beds for women in order to bring their facilities up to a par with those for men.

Only 249 physicians have been graduated from the Faculty of Medicine since its founding in 1932. Probably not many more than 200 are practicing at the present time, and there are about 15 or 20 foreign physicians in the country.

A limiting factor in relation to medical education, as well as all other forms of higher education in Afghanistan, is the small number of students who are graduating each year from the secondary schools. However, the number is increasing year by year, and in addition just this past year the government has decided to allocate a larger number of them to the Faculty of Medicine. Whereas in recent years the number of admissions to the study of medicine has been about 35 or 40, it was expected at the time of this visit that about 100 would be admitted this year. This poses a serious problem to the Faculty in providing the facilities and instructors to teach that number of students. In its 5-year plan the government has allocated substantial sums of money to provide the facilities and to upgrade the teaching hospitals.

The training of nurses is also the responsibility of the Faculty of Medicine, and in this area too it is faced with a serious problem. Up to the present time few nurses have been trained. They are mostly male nurses. The Faculty has asked WHO for help, and a 5-year plan has been developed which calls for a rapid expansion in nurse training.

The training of midwives, on the other hand, is under the jurisdiction of the Ministry of Health. For this purpose it uses the recently upgraded maternity hospital in Kabul. Assistance in providing better equipment was given by UNICEF, and services were greatly improved with the assistance of WHO personnel, especially by Dr. Gade, a Danish woman physician who won the hearts of the Afghan

personnel with whom she worked. She established the midwifery school in a large building constructed on the grounds by the government. The school is now under the direction of a princess of the royal family.

Public Health Activities

In addition to bringing typhus fever under control, the government is making good progress in eradicating malaria and in establishing maternal and child health facilities. A start has been made on tuberculosis and venereal disease control and in the improvement of sanitation in a few limited areas of the country.

The Faculty of Medicine is expanding its training program for both male and female nurses, and the Ministry of Health is expanding its training programs in public health for physicians, public health nurses, midwives, sanitarians, laboratory personnel, and statistical personnel. The Ministry of Health, with the assistance of WHO, has recently established a school for sanitarians which is being expanded.

Public Health Institute

To develop and coordinate these various training activities the Ministry of Health is in the process of establishing an Institute of Public Health. In addition to the development and coordination of training activities the institute will administer the public health laboratory, the Ministry's health statistics activities, and a new health education department. It will establish a public health library, and it will conduct epidemiological and nutritional studies and surveys.

Out of these activities the Minister feels that there will be derived the means for more effective evaluation of public health programs and for the intelligent establishment of program priorities realistically related to disease prevalence, the socioeconomic condition of the people, and the available resources. It is an ambitious undertaking for a country in the early stages of its economic development but one which should make a substantial contribution to the effective execution of the country's public health programs.

most of the Afghan middle and upper-middle class.

The nomadic herders, known as *Kochis*, or choochies, probably constitute about 25 percent of Afghanistan's population of 12 million. Many travel from their summer ranges along the Iranian border and the Hari River Valley to Pakistan for the cold months, often crossing the Khyber Pass at the rate of 10,000 a day at the height of the migration (1-3).

Living Conditions

Even in the cities the scarcity and high cost of lumber prohibits the use of wooden houses. Plastered mud brick, baked brick, and stone are the materials used. Many of the poorer homes have domed roofs to avoid the necessity of using wood to support a flat roof. The flat roofs are covered with sun-dried mud which sheds water quite well in a heavy rain but which in a slow rain or sleet often leaks. The better homes in the cities are rather well constructed and have tile floors, but the poorer homes usually have floors which are not impervious to water.

There is much overcrowding with consequent hazard of transmission of communicable diseases. Furthermore, in the kitchens one seldom finds the sinks, tables, and utensils which would facilitate the sanitary handling of food (1).

Water Supplies and Sanitation

Kabul and some of the larger towns have water supplies with community taps. The government is taking steps to improve these supplies and make them safer. In fact, the city of Kabul is drawing up plans for a modern water supply system. In most of Afghanistan not only agriculture but the gardens and trees in the cities and villages depend upon irrigation. The irrigation ditches are subject to pollution from many sources, and it is from these that some of the people derive their water supplies for domestic use. Also, vendors use this water to freshen their vegetables. (Another great hazard to the sanitary quality of vegetables is the use of night soil as fertilizer.)

In many of the small towns and rural areas,

well water is used. The Ministry of Health is planning a large well-drilling program to increase the availability of this source of supply and is preparing sanitarians to supervise construction and to teach sanitary maintenance of the wells.

These sanitarians will also be utilized to help improve general conditions of sanitation and hygiene, and it is expected that their effectiveness will be augmented by an aggressive health education program which the Ministry is planning.

Health Conditions

The Ministry of Health has established a health statistics section and, with the help of the World Health Organization, is taking steps to improve the collection and analysis of statistics. As things stand now, however, there is very little factual material on which to base estimates as to length of life or the prevalence of disease. Estimates of life expectancy in Afghanistan range from 20 to 40 years.

Malaria, tuberculosis, intestinal diseases, and poor nutrition are said to be the principal preventable health problems, but a nationwide malaria control program, assisted by WHO and UNICEF, is rapidly bringing malaria under control. Typhoid and paratyphoid fever and the dysenteries are endemic with epidemic outbreaks. Until recently, typhus fever epidemics occurred regularly, but now they have largely been brought under control. In 1956 there was not a single confirmed case of typhus fever in the country. Infestation with parasites is almost universal in children, and diarrheal diseases are extremely common. Trachoma and other eye disorders are prevalent, at least in some areas. The prevalence of venereal diseases, on the other hand, appears to be relatively low. Any estimate of the infant mortality rate would be little better than a guess, but it is undoubtedly well over 100 per 1,000 live births (1, 3-5).

Medical Care Facilities

Most medical institutions in this country are supported by the government, and treatment is provided free. There are 35 hospitals, 5 in

International Population Movements as Aids to Communicable Disease Control

CLARENCE A. SMITH, M.D., JOHANNES STUART, Ph.D.,
and WILLIAM C. WATSON, Jr.

POPULATION movements have always been viewed as a real or potential hazard in the spread of communicable disease. In the Crusades, the internecine conflicts of the Renaissance, and the conquests which brought the Americas into the orbit of European culture, disease was always one of the horsemen riding side by side with the soldier, the merchant, and the priest. The traveler's course might be traced by the implantation of disease as well as by the growing weeds whose seeds had dropped from his saddlebags.

It is only in recent years, and even then with little real appreciation of its inherent logic and potential strength, that public health workers have taken advantage of population movements and used them as a positive force for health by combining a few simple ingredients of border inspection, quarantine, treatment, and control epidemiology.

While several rudimentary examples of this approach in regard to mobile populations have emerged from the operation of the venereal disease control program of the United States, no example existed prior to 1956 in which use was made of an international population movement

that would apply all of the basic elements of venereal disease control for the benefit of two countries.

It was therefore a program of new stature which the national health agencies of Mexico and the United States undertook in 1956 when they decided to weld together the elements of a complete international control program and apply it to Mexican migrant laborers coming into the United States during the growing and harvesting season.

It should be clearly understood that such synthesis cannot be affected at will. It is based on mutual respect and understanding between the two nations as well as upon a number of preconditions, including facility and speed in diagnosis and treatment, the existence of a contact-eliciting and contact-tracing mechanism, and the availability of forces which can be mobilized to accomplish diagnosis, treatment, and contact investigation. Even in 1956 when jet planes hurtled through the air at speeds far exceeding sound and the mysteries of orbital space had become the commonplace of newspaper headlines, these factors were not entirely adequate to cope with all aspects of the combined programs; they were present in sufficient degree, nevertheless, to merit the sizable demonstration test which we describe.

More than 400,000 Mexican agricultural workers enter the United States each year to work in our fields at the times when there is an urgent seasonal demand for labor. Physical examinations are given these workers by the Public Health Service Division of Foreign Quarantine, both at the recruitment centers in

The authors are all with the Public Health Service. Dr. Smith serves as deputy chief of the Communicable Disease Center, Dr. Stuart, public health advisor in the Office of the Surgeon General, and Mr. Watson, public health advisor in the Venereal Disease Branch of the Center. By special arrangement, the article appears simultaneously, in substantially the same form, in the Boletín de la Oficina Sanitaria Panamericana.

The Helmund Valley

To go from Kabul to Lashkar Gah, we flew back to Kandahar and then traveled 90 miles west over a gravel road, one of the best in Afghanistan. Both Kandahar and Lashkar Gah are in an area which in recent geologic time was probably part of a vast lake without an outlet. The area still has no outlet for the streams and rivers which flow into and through it. They flow into a great salty depression in the southwest portion of the area and there the water which does not sink into the ground evaporates.

Lashkar Gah, a new city located on the Helmund River, is the headquarters of a large irrigation and land development project administered by the Helmund Valley Authority, which is similar in some respects to the Tennessee Valley Authority. The project is being used for the settlement of large numbers of people from the nomadic tribes.

Lashkar Gah is being built for the specific purpose of providing headquarters for HVA and for the government of Girishik Province. It is expected that the provincial government will be moved there soon. The city derives its name from a city which was once a flourishing military cantonment in an ancient Afghan empire, but which is marked today only by hulking ruins nearby. In the neighborhood are also ruins of a castle which was 8 stories high and covered some 2 or 3 acres of ground.

The city is being built according to plan, with well laid-out streets, well designed and constructed houses, a good water supply, and a sewage-disposal system. The foundations are being laid for a 30-bed demonstration health center and training school for health personnel, which will be modern in design and equipment. With the assistance of the International Cooperation Administration, the health center will be the central facility for a network of subsidiary health centers in Girishik Province, which forms the major part of the area under the jurisdiction of HVA. It is planned that from these health centers not only the new settlers but the old inhabitants of the area also will receive the benefits of modern medicine and

public health and the present-day teachings of hygiene and sanitation (2, 3).

Summary

Substantial progress has been made in establishing the medical and public health institutions and organizations needed in Afghanistan. Training of essential personnel is necessarily slow because of the scarcity of people with the prerequisite educational qualifications, but this problem is being alleviated as the educational system expands.

Progress is being made also in combating some of the country's most serious preventable diseases, notably malaria and typhus fever, and in developing maternal and child health activities, but much remains to be done in the *entire field of public health and sanitation*. Implementation of the plans of the Ministry of Health for the development of its new Institute of Public Health should contribute materially to the improvement of health facilities and programs.

Another interesting development which is planned for the near future is the establishment of a public health program in the Helmund Valley which will provide health services for nomads who are being settled on newly irrigated land and will at the same time provide a demonstration of the application of public health methods and an area for the training of public health personnel.

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Pursuant to our agreement, and in cooperation with the U. S. Department of Labor, two of the reception centers—El Paso, Tex., and El Centro, Calif.—were chosen for the assignment of such teams over the period August 16 to October 12, 1956. This period covers the great fall harvesting season when the migrant movement swells to a peak. During that period 115,506 Mexican workers were blood tested; 9,240 were found reactive to a serologic test for syphilis; 7,098 were given treatment in the United States; 1,532 notifications were sent to Mexican health departments on workers not found prior to their return to Mexico; and 7,004 marital contact reports on the wives of workers with a positive test for syphilis were sent to Mexican health departments. All in all, then, the control aspect of this program concerned itself with 16,244 syphilis suspects, comprising the 9,240 men who were positive reactors and the 7,004 women who were married to positive reactors.

Who were these people, and what happened to them? Table 1 and the chart show the distribution of the male workers and states from which they came. Almost 80 percent of all the migrants tested at El Centro and El Paso came from the six states of Chihuahua, Durango, Guanajuato, Jalisco, Michoacan, and Zacatecas, but the rate of positivity for this group was somewhat lower than average. Certain other areas with a lesser flow of migrants, such as Baja California (Norte), Distrito Federal, Guerrero, and Nayarit, contributed markedly higher than average rates of positivity. Although these states vary widely in the known prevalence of pinta, no attempt was made to evaluate the role which each of these diseases played in the total numbers of serologically positive tests.

Marquez, Rein, and Arias, in reporting findings of the study of pinta in Mexico carried out by the Mexican Ministry of Health during 1929-31, indicate that those states affected were Guerrero, Oaxaca, Mexico, Chiapas, Michoacan, Puebla, Tabasco, Morelos, Nayarit, Veracruz, and the highest prevalence was found in Guerrero where approximately 20 percent of the population is affected.

The Mexican Ministry of Health had requested us to prepare the tabulations given in table 1 since this would give them a helpful

cross section analysis of treponematoses in the areas from which migration came. The data do not, of course, reflect internal variations within the states concerned but, since the majority of the contract workers were rural and since the migratory populations have other identifying characteristics, the information contained in the table should be of considerable use to control programs in the areas concerned. The table provides a current index to the extent of the problem among the group tested.

But, however important it may be to define the extent of a problem, it is much more important to do something about it. Herein lay a great difficulty. We knew that the stay of the Mexican workers in the reception centers was usually for only a few hours. It was something of a problem even to collect a blood speci-

Table 2. Disposition of 9,240 Mexican agricultural workers with positive serologic tests for syphilis, by State to which cases were referred

| State | Number of workers referred | Treated for syphilis | | Not located |
|--|----------------------------|----------------------|---------|-------------|
| | | Number | Percent | |
| Arizona..... | 38 | 10 | 26.3 | 28 |
| California..... | 5,468 | 4,215 | 77.1 | 1,253 |
| Colorado..... | 30 | 30 | 100.0 | 0 |
| Kansas..... | 6 | 6 | 100.0 | 0 |
| New Mexico..... | 899 | 780 | 86.6 | 96 |
| Texas..... | 2,325 | 2,057 | 88.5 | 268 |
| Not referred to a State ¹ | 474 | 0 | 0 | 474 |
| Total..... | 9,240 | 7,098 | 76.8 | 2,119 |

¹ Of those not located or not referred to a State, 1,532 were reported to the Mexican Ministry of Health for action upon their repatriation. The remainder were not reported to Mexico for lack of complete address.

men on all comers during those few hours because the centers were set up to process as many as 4,000 men per day, and our teams experienced a number of days when the flow was well over 3,000. Even writing a laboratory report form on each man was out of the question, especially since most of our team members did not speak Spanish. So we decided to microfilm the workers' Labor Department identification forms, an important factor in the control operation because it also contained the name, re-

Mexico and the reception centers on the American side of the border. These examinations serve to detect most of the clinically evident venereal disease. However, in the absence of a blood-testing program, syphilitic workers without clinical symptoms at the time of admission have gone undetected. Mexican and United States health workers have repeatedly explored means of using the opportunity presented by these population movements to develop a syphilis control program benefiting both countries.

Mass Blood Testing Begun

Because of difficulties of organization and finance, no substantial combined activities were undertaken until 1956, when it was informally

arranged between the two Federal health agencies that as many of the migrants as possible would be blood tested in Mexico and that the Public Health Service would assign syphilis control teams to at least some of the five reception centers through which Mexican agricultural workers pass to be processed and assigned to the growers who use their services.

The United States testing teams reported that an occasional worker volunteered evidence of a recent serologic test for syphilis. It was, however, impossible for these teams, handling a high volume of workers with whom they had communication difficulties, to determine how many had been blood tested in Mexico. It is the activities of the United States teams that we report in the following paragraphs.

Table 1. Mexican border testing program, 1956: number tested and number and percent reactive, by Mexican state of origin

| Mexican state | El Centro | | | El Paso | | | Total | | |
|--------------------------------------|---------------|-----------------|------------------|---------------|-----------------|------------------|---------------|-----------------|------------------|
| | Number tested | Number reactive | Percent reactive | Number tested | Number reactive | Percent reactive | Number tested | Number reactive | Percent reactive |
| Aguascalientes..... | 247 | 9 | 3.6 | 146 | 14 | 9.6 | 393 | 23 | 5.9 |
| Baja California..... | 1,516 | 198 | 13.1 | 1 | 0 | 0 | 1,517 | 198 | 13.1 |
| Baja California Sur (territory)..... | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Campeche..... | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chiapas..... | 4 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 |
| Chihuahua..... | 20 | 1 | 5.0 | 22,502 | 1,464 | 6.5 | 22,522 | 1,465 | 6.5 |
| Coahuila..... | 17 | 4 | 23.5 | 1,606 | 213 | 13.3 | 1,623 | 217 | 13.4 |
| Colima..... | 408 | 37 | 9.1 | 5 | 0 | 0 | 413 | 37 | 9.0 |
| Distrito Federal..... | 599 | 87 | 14.5 | 222 | 30 | 13.5 | 821 | 117 | 14.3 |
| Durango..... | 3,162 | 256 | 8.1 | 10,619 | 845 | 8.0 | 13,781 | 1,101 | 8.0 |
| Guanajuato..... | 12,635 | 843 | 6.7 | 825 | 38 | 4.6 | 13,460 | 881 | 6.5 |
| Guerrero..... | 3,968 | 752 | 19.0 | 408 | 52 | 12.7 | 4,376 | 801 | 18.1 |
| Hidalgo..... | 241 | 20 | 8.3 | 51 | 3 | 5.9 | 292 | 23 | 7.9 |
| Jalisco..... | 13,469 | 1,369 | 10.2 | 4,225 | 423 | 10.0 | 17,694 | 1,792 | 10.1 |
| Mexico..... | 2,161 | 140 | 6.5 | 1,364 | 65 | 4.8 | 3,525 | 205 | 5.8 |
| Michoacan..... | 10,605 | 763 | 7.2 | 913 | 49 | 5.4 | 11,518 | 812 | 7.0 |
| Morelos..... | 652 | 68 | 10.4 | 126 | 13 | 10.3 | 778 | 81 | 10.4 |
| Nayarit..... | 517 | 69 | 13.3 | 2 | 0 | 0 | 519 | 69 | 13.3 |
| Nuevo Leon..... | 3 | 0 | 0 | 8 | 1 | 12.5 | 11 | 1 | 9.1 |
| Oaxaca..... | 3,557 | 266 | 7.5 | 466 | 32 | 6.9 | 4,023 | 298 | 7.4 |
| Puebla..... | 1,168 | 61 | 5.2 | 527 | 25 | 4.7 | 1,695 | 86 | 5.1 |
| Queretaro..... | 171 | 14 | 8.2 | 402 | 19 | 4.7 | 573 | 33 | 5.8 |
| Quintana Roo..... | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| San Luis Potosi..... | 816 | 44 | 5.4 | 61 | 1 | 1.6 | 877 | 45 | 5.1 |
| Sinaloa..... | 409 | 28 | 6.8 | 0 | 0 | 0 | 409 | 28 | 6.8 |
| Sonora..... | 273 | 29 | 10.6 | 1 | 0 | 0 | 274 | 29 | 10.6 |
| Tabasco..... | 190 | 21 | 12.6 | 2 | 0 | 0 | 192 | 21 | 12.5 |
| Tamaulipas..... | 18 | 1 | 22.2 | 29 | 5 | 17.2 | 47 | 6 | 12.8 |
| Thaxcala..... | 321 | 20 | 6.2 | 278 | 26 | 9.4 | 599 | 46 | 7.7 |
| Veracruz..... | 179 | 14 | 7.8 | 57 | 7 | 12.3 | 236 | 21 | 8.9 |
| Yucatan..... | 129 | 13 | 10.1 | 8 | 0 | 0 | 137 | 13 | 9.5 |
| Zacatecas..... | 5,637 | 304 | 5.4 | 6,968 | 419 | 6.0 | 12,605 | 723 | 5.7 |
| Unknown..... | 546 | 54 | 9.9 | 45 | 5 | 11.1 | 591 | 59 | 10.0 |
| Total..... | 63,639 | 5,491 | 8.6 | 51,867 | 3,719 | 7.2 | 115,506 | 9,210 | 8.0 |

In the States of the Pacific Coast we had a strong case-finding ally in the Continental Casualty Company, the insurance firm which provides medical care for braceros on the west coast. They voluntarily proposed that their officials in California arrange, with the aid of the growers' association and farmers, to locate each serologically positive Mexican worker and bring him in to the office of their local physician for diagnosis and treatment. We accepted this offer with great alacrity, although we assured the company that their task would not be an easy one.

Nor was it accomplished without some substantial difficulties. Some few growers' associations at the peak of their seasonal work were at first apathetic or even hostile. Some physi-

cians found themselves so burdened with the other medical problems of braceros that they could not give effective service to the syphilis suspects, so that the Public Health Service had to send in help. But the great bulk of seropositive men were finally found and treated.

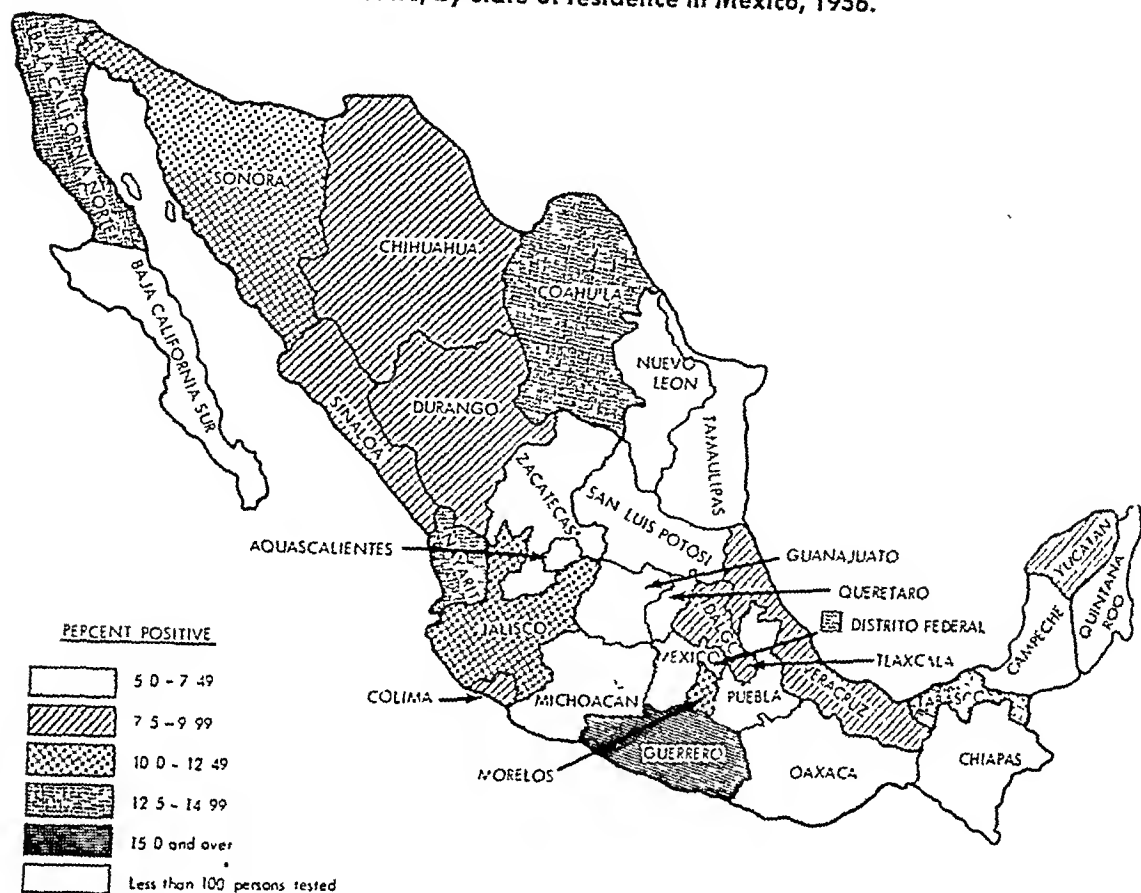
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Seventy-seven percent of the serologic re-

Table 3. Disposition of 7,004 marital contacts of seropositive Mexican workers reported for investigation in Mexico

| State | Number referrals sent | Number returned | Brought to treatment | Returned to treatment | Already under treatment | Adequate treatment | Located but uncooperative | Not infected | Cannot locate | Insufficient information | Moved | Other |
|---------------------------------|-----------------------|-----------------|----------------------|-----------------------|-------------------------|--------------------|---------------------------|--------------|---------------|--------------------------|-------|-------|
| Aguascalientes | 16 | 7 | 1 | 0 | 0 | 0 | 0 | 5 | 0 | 1 | 0 | 0 |
| Baja California | 155 | 104 | 5 | 0 | 0 | 1 | 20 | 26 | 28 | 19 | 5 | 0 |
| Baja California Sur (territory) | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| Campeche | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chiapas | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chihuahua | 996 | 53 | 6 | 0 | 0 | 3 | 1 | 23 | 20 | 0 | 0 | 0 |
| Coahuila | 149 | 20 | 1 | 0 | 0 | 1 | 1 | 7 | 0 | 0 | 10 | 0 |
| Colima | 25 | 20 | 3 | 0 | 2 | 0 | 0 | 14 | 0 | 0 | 0 | 1 |
| Districto Federal | 82 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Durango | 804 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Guanajuato | 754 | 115 | 8 | 0 | 0 | 0 | 3 | 68 | 28 | 0 | 4 | 4 |
| Guerrero | 583 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hidalgo | 17 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 4 | 5 | 0 |
| Jalisco | 1,400 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mexico | 151 | 49 | 7 | 0 | 2 | 1 | 0 | 17 | 16 | 5 | 1 | 0 |
| Michoacan | 671 | 42 | 1 | 2 | 1 | 0 | 6 | 32 | 0 | 0 | 0 | 0 |
| Morelos | 48 | 10 | 10 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 |
| Nayarit | 49 | 5 | 2 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 |
| Nuevo Leon | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Oaxaca | 212 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Puebla | 67 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Queretaro | 14 | 7 | 1 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 |
| Quintana Roo | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| San Luis Potosi | 39 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sinaloa | 12 | 9 | 0 | 0 | 0 | 0 | 1 | 5 | 2 | 0 | 1 | 0 |
| Sonora | 26 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 |
| Tabasco | 18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Tamaulipas | 9 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Tlaxcala | 33 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Veraacruz | 10 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Yucatan | 7 | 6 | 0 | 0 | 0 | 0 | 1 | 5 | 0 | 0 | 0 | 0 |
| Zacatecas | 600 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unknown | 55 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 7,004 | 471 | 45 | 2 | 5 | 6 | 33 | 210 | 111 | 29 | 28 | 5 |

Percentage of positive reactors to serologic tests for syphilis among 115,506 Mexican contract laborers, by state of residence in Mexico, 1956.



lationship, and address of his nearest-of-kin, usually his wife.

On this Labor Department form we stamped the number of the worker's blood tube. Then, after the name and address of the grower to whom he had been assigned was entered on the form, we microfilmed the entire document. We therefore had in our possession on one document a complete record of where we could locate both the man and his wife—a document obtained at a cost of seconds per person tested.

Case Finding Expedited

We knew that finding these workers after they had left the reception centers would not be easy. Back in 1951 we had experienced bitter failure in our first attempt to do this. In that year we tested some 11,000 Mexican braceros, sent their blood specimens to the Public Health Service Venereal Disease Research Laboratory

in Atlanta, and the positive reports to the State health department concerned. Because of the time lapse involved, most of the persons with positive blood were never found: they had moved from the farm of their original assignment.

This time we were prepared to deal more expeditiously with the laboratory phase of the program. With the active and energetic cooperation of the State health department laboratories of Arizona and Texas, serologic reports reached the reception center within 24 hours after blood specimens were taken. Blood was flown from the center to the laboratory in the afternoon, analyzed the following morning, and reports returned to the center on the same day. Suspect reports prepared by the center on all individuals with a seropositive test for syphilis might therefore reach the destination of the bracero very shortly after his arrival on the farm of his first work assignment.

In the States of the Pacific Coast we had a strong case-finding ally in the Continental Casualty Company, the insurance firm which provides medical care for braceros on the west coast. They voluntarily proposed that their officials in California arrange, with the aid of the growers' association and farmers, to locate each serologically positive Mexican worker and bring him in to the office of their local physician for diagnosis and treatment. We accepted this offer with great alacrity, although we assured the company that their task would not be an easy one.

Nor was it accomplished without some substantial difficulties. Some few growers' associations at the peak of their seasonal work were at first apathetic or even hostile. Some physi-

cians found themselves so burdened with the other medical problems of braceros that they could not give effective service to the syphilis suspects, so that the Public Health Service had to send in help. But the great bulk of seropositive men were finally found and treated.

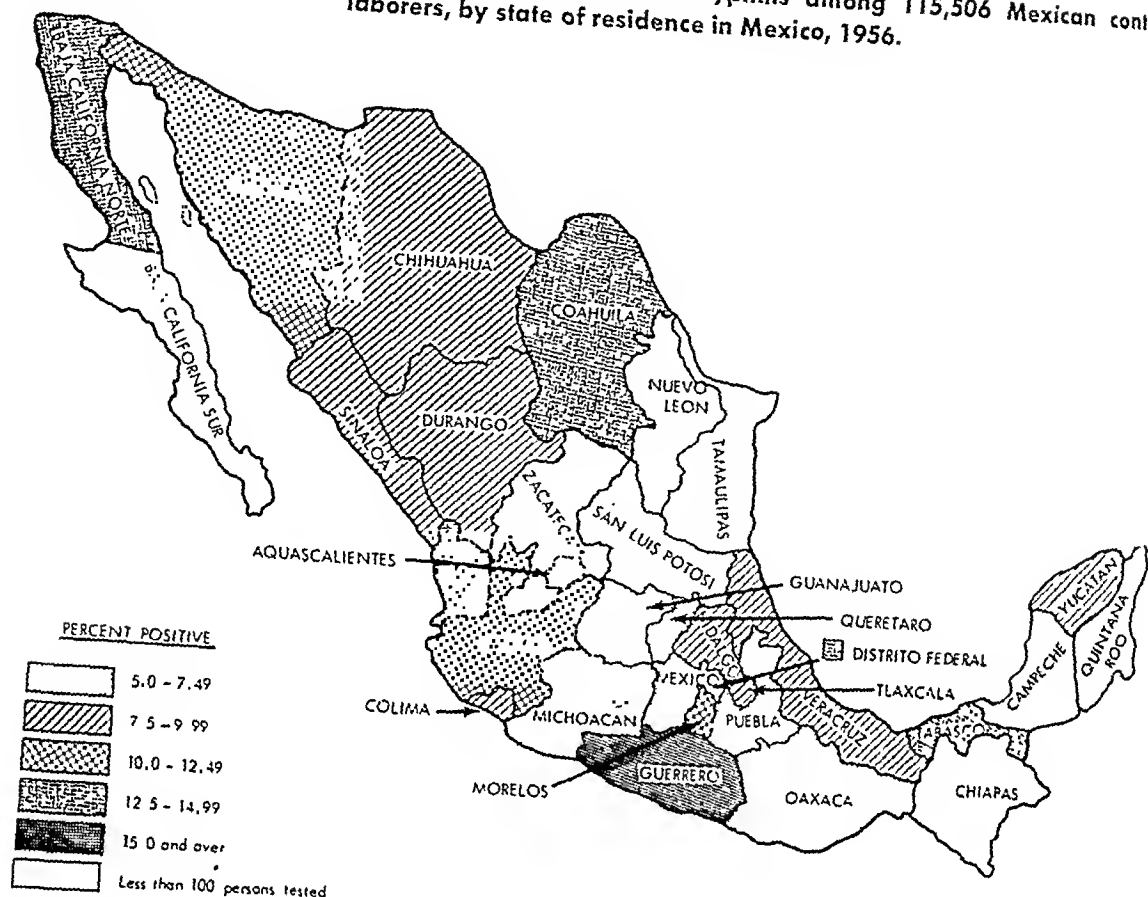
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Table 3. Disposition of 7,004 marital contacts of seropositive Mexican workers reported for investigation in Mexico

| State | Number referrals sent | Number re-turned | Brought to treatment | Re-turned to treatment | Al-ready under treatment | Ade-quate treatment | Located but un-cooper-ative | Not in-fected | Can-not locate | Insuf-ficient infor-mation | Moved | Other |
|---------------------------------|-----------------------|------------------|----------------------|------------------------|--------------------------|---------------------|-----------------------------|---------------|----------------|----------------------------|-------|-------|
| Aguaascalientes | 16 | 7 | 1 | 0 | 0 | 0 | 0 | 5 | 0 | 1 | 0 | 0 |
| Baja California | 155 | 104 | 5 | 0 | ----- | 1 | 20 | 26 | 28 | 19 | 5 | 0 |
| Baja California Sur (territory) | 2 | 2 | 0 | 0 | ----- | ----- | ----- | ----- | ----- | ----- | 2 | 0 |
| Campeche | 0 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| Chiapas | 0 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| Chihuahua | 996 | 53 | 6 | 0 | 0 | 3 | 1 | 23 | 20 | 0 | 0 | 0 |
| Coahuila | 149 | 20 | 1 | 0 | 0 | 1 | 1 | 7 | 0 | 0 | 10 | 0 |
| Colima | 25 | 20 | 3 | 0 | 2 | 0 | 0 | 14 | 0 | 0 | 0 | 1 |
| Distrito Federal | 82 | 0 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| Durango | 804 | 0 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| Guanajuato | 754 | 115 | 3 | 0 | 0 | 0 | 3 | 68 | 28 | 0 | 4 | 4 |
| Guerrero | 583 | 0 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| Hidalgo | 17 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 4 | 5 | 0 |
| Jalisco | 1,400 | 0 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| Mexico | 151 | 49 | 7 | 0 | 2 | 1 | 0 | 17 | 16 | 5 | 1 | 0 |
| Michoacan | 671 | 42 | 1 | 2 | 1 | 0 | 6 | 32 | 0 | 0 | 0 | 0 |
| Morelos | 48 | 10 | 10 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| Nayarit | 49 | 5 | 2 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 |
| Nuevo Leon | 0 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| Oaxaca | 212 | 0 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| Puebla | 67 | 0 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| Queretaro | 14 | 7 | 1 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 |
| Quintana Roo | 0 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| San Luis Potosi | 39 | 0 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| Sinaloa | 12 | 9 | 0 | 0 | 0 | 0 | 1 | 5 | 2 | 0 | 1 | 0 |
| Sonora | 26 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 |
| Tabasco | 18 | 0 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| Tamaulipas | 9 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| tlaxcala | 33 | 0 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| Veracruz | 10 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Yucatan | 7 | 6 | 0 | 0 | 0 | 0 | 1 | 5 | 0 | 0 | 0 | 0 |
| Zacatecas | 600 | 0 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| Unknown | 55 | 0 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| Total | 7,004 | 474 | 45 | 2 | 5 | 6 | 33 | 210 | 111 | 29 | 28 | 5 |

Percentage of positive reactors to serologic tests for syphilis among 115,506 Mexican contract laborers, by state of residence in Mexico, 1956.



relationship, and address of his nearest-of-kin, usually his wife.

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in Atlanta, and the positive reports to the State health department concerned. Because of the time lapse involved, most of the persons with positive blood were never found; they had moved from the farm of their original assignment.

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their cost. Venereal disease control programs in the United States, as one aspect of their effectiveness, have always been mounted on the firm base of economical operation. This program was no exception, as can be seen from table 4. Total cost of blood testing was held to less than 60 cents per person, followup and treatment to an average cost of \$3.39 per person, and the unit cost per suspect to 19 cents per report sent.

Conclusions

This program demonstrates several novel combinations: the utilization of a quarantine procedure as a basis for a full-scale venereal disease case-finding, treatment, and contact investigation program, as well as for depiction of the geographic distribution of another country's problem; the practical elimination of distance in laboratory functioning; the use of microfilm as a technique for venereal disease control; and the backing of an insurance company in health control operations.

Attention to operational novelties, however, emphasizes process over concept: the concept that the quarantine procedure shares with other testing devices the powerful potential of a case-finding tool.

Quarantine will continue to maintain the devices which protect against the hazards of disease importation. But it also may become—possibly for chronic as well as communicable disease—one of the screening devices which in the future will share with other health services the responsibility and the reward for alerting the individual and the community—the community of nations included—to the presence of disease and the needs and methods for its control.

REFERENCE

- (1) Marquez, F., Rein, C. R., and Arias, O.: Mal del pinto in Mexico. *Bull. World Health Org.* 13: 299-322 (1955).

NIH Board of Scientific Counselors

A panel of six non-Federal scientists has been selected to comprise the Board of Scientific Counselors, established in February 1958 by the Public Health Service to review, discuss, and make recommendations on research in laboratories of the National Institute of Neurological Diseases and Blindness. The board held its first meeting in Bethesda, Md., February 20 and 21, 1958.

Chairman of the board is Dr. Hallowell Davis, director of research at the Central Institute of the Deaf, St. Louis. He will serve 4 years.

Appointed for 3-year terms are Dr. Howard J. Curtis, chairman, biological division, Brookhaven Laboratory, Upton, N. Y., and Dr. A. Earl Walker, professor of neurosurgery, the Johns Hopkins University.

The 2-year term members are Dr. Raymond Adams, chief of neurological services, Massachusetts General Hospital, Boston; Dr. Algernon B. Reese, clinical professor of ophthalmology, Columbia University College of Physicians and Surgeons; and Dr. Roger J. Rossiter, head of the department of biochemistry, University of Western Ontario, London, Canada.

actors were treated (table 2). Of the 2,119 not located, suspect report forms were sent on 1,532, after the crop season was over. Information on the suspect was transmitted on the recently instituted multilingual form developed by the Pan American Sanitary Bureau and now available for use by all nations of the Americas in the international reporting of venereal disease contacts and suspects. This form, sent to the Mexican state health department of jurisdiction, advised in Spanish that the person named had been tested in the United States, that the result of this test was positive, and that he had returned to Mexico before diagnosis could be made and treatment instituted.

This completed our work on the 9,240 braceros whose blood tests were positive. Its overall efficiency was 77 percent, even without accounting for the men who might subsequently have been located in Mexico. This is a pretty fair degree of case-finding efficiency for any group of syphilis suspects, but is phenomenal in relation to so highly mobile a foreign language group.

As has been indicated earlier, we reported to Mexico a total of 7,004 women who were marital partners of braceros with a positive test for syphilis. The reports on these wives were also sent on the Pan American Sanitary Bureau form. Each of these, too, carried an individual communication in Spanish advising the recipient health department that the person named in the form was a familial contact of a serologically positive Mexican worker currently in the United States. It further requested that the Public Health Service be notified as to the results of investigation.

Relatively few replies were received indicating what action had been taken (table 3). This is not particularly surprising. In the first place, our experience in the United States indicates that there is a curious reluctance on the part of several State health departments to report a disposition on a contact report received from out of State. Since reporting to another country involves the mental bridging of an even larger gap, we can readily appreciate how much good case finding may have been accomplished through the use of these forms without our obtaining disposition reports.

We were also aware that a number of the addresses of wives which we used were incorrect

Table 4. Costs of blood testing, followup and treatment, and contact investigation of 115,506 Mexican agricultural laborers and their marital contacts

| Activity | Total | Unit cost | |
|---|----------|-----------|-----------|
| | | EI Paso | EI Centro |
| Blood testing ¹ ----- | \$0. 564 | \$0. 597 | \$0. 537 |
| Personnel----- | . 241 | . 268 | . 220 |
| Salaries----- | . 147 | . 168 | . 130 |
| Travel----- | . 018 | . 017 | . 019 |
| Per diem----- | . 076 | . 081 | . 070 |
| Laboratory----- | . 223 | . 231 | . 215 |
| Other----- | . 099 | . 098 | . 102 |
| Followup and treatment ^{2,3} ----- | 3. 393 | 6. 243 | 1. 142 |
| Salaries----- | | | . 516 |
| Travel----- | | | . 120 |
| Per diem----- | | | . 232 |
| Drugs----- | | | . 574 |
| Contact investigation: | | | |
| Per report sent----- | . 194 | | |
| Per report returned----- | 2. 865 | | |
| Per case brought to treatment----- | 23. 414 | | |

¹ Per person tested.

² Per person treated.

³ Itemization of followup and treatment costs not available for EI Paso.

or insufficient. Even though these addresses may be of great importance to the workers in the case of illness or death; poor communications, poor understanding, and possibly other factors work against their accuracy.

Finally, the Pan American Sanitary Bureau form and the contact investigation procedure is relatively new to many Mexican health departments, particularly those of the rural areas from which most of the braceros come.

In spite of the low rate of return on disposition, it is of interest that almost a fifth of the cases reported as having been examined were brought or returned to treatment, indicating the relatively rich epidemiological vein which this reporting method makes available. If 17.5 percent of all the wife suspects were in need of treatment, the information contained in the 7,004 suspect reports might have led to the treatment of some 1,250 women with syphilis in Mexico.

Many desirable public health programs are relatively or absolutely impractical because of

Samples taken in 1955 indicate that most atmospheric particles likely to reach the lungs had a radioactivity of less than 5 $\mu\text{pc.}$, but the radioactivity of single particles was as high as 500 $\mu\text{pc.}$ The average concentration of beta activity was about 5 $\mu\text{pc.}$ per cubic meter of air.

Radioactive Particles in the Atmosphere at Cincinnati, Ohio

R. LOUIS BRADSHAW, M.S.E.E., and LLOYD R. SETTER, Ph.D.

THE RADIOACTIVITY of air particles in samples collected in 20 to 30 municipalities in the National Air Sampling Network, established in 1953, indicated a thousandfold or more increase in beta radioactivity immediately following known tests of nuclear weapons. It was suspected that substantial amounts of the total radioactivity might be associated with discrete particles which might find their way into the respiratory tract of man. To determine the distribution of radioactivity in atmospheric particulate matter, a study was made of air samples collected at the Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, during the winter and spring of 1955.

Sampling Apparatus

The particles in air samples were separated into primary and secondary fractions by a cyclone separator (A) in series with a filter (fig. 1). An air sampling rate of approximately 40 cubic feet per minute was selected, since at

Mr. Bradshaw, presently assigned to the Oak Ridge National Laboratory, Oak Ridge, Tenn., was formerly with the Robert A. Taft Sanitary Engineering Center of the Public Health Service, Cincinnati, Ohio. Dr. Setter is chemist in charge, radiological investigations, at the Center.

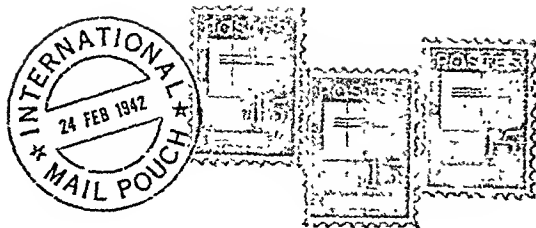
this flow the unit has an efficiency versus particle-size curve comparable to that of the upper respiratory system in man (1,2).

A nosepiece on the intake of the cyclone separator provided a face velocity of 25 liters per minute per square centimeter, which approximates the nasal air velocity of a man at work. Particles passing through the separator were caught on the glass fiber filter. These, constituting the secondary fraction, are the particles that might penetrate to the alveoli in actual breathing. They were deposited on an effective filter area of 63 square inches.

Procedure

The sampler was placed on the roof terrace off the east side of the auditorium of the Sanitary Engineering Center, approximately three stories above the ground. The sampling rate was adjusted by a bleeder valve on the high-volume blower (capacity of 60-80 cubic feet per minute) to 40.5 cubic feet per minute at the beginning of each sampling period. The sampling rate at 24 hours was rarely more than 10 percent below the initial rate. The average of the initial and final rates was taken for flow calculation.

Two samples were collected February 16-18, 1955, before the first United States test of nuclear weapons that month. From February



This is the Way We Brush—

Toothbrushes were given 70 students in the small, 4-room school in Espilola, near Babol, Iran, with instruction in oral hygiene. The school, completed last year with point 4 assistance and staffed by two young, enthusiastic teachers, is the first program demonstration of school health in the Caspian region.

The children have been weighed and measured and tested for hearing and vision. The doctor of the Babol Health Center gave them physical examinations. We hope to make arrangements with private physicians and the Ministry of Health Hospital in Babol to correct the children's serious physical defects. The sanitation division is setting up hand-washing facilities at the school.

—GLEN W. McDONALD, M.D., M.P.H., *chief, Public Health Division, U. S. Operations Mission, Iran.*

Bandit Attack

Ethiopian bandits attacked one of our drilling supervisors, Robert House, between Jigjiga and Dik. Shot in the back and twice in the face, he miraculously escaped death. He was evacuated from Jigjiga to Addis Ababa, to Asmara, Eritrea, to Bahrain in the Persian Gulf, to Germany, and finally to the United States, where he is recovering.

—A. C. CURTIS, M.D., *chief, Health and Sanitation Division, U. S. Operations Mission, Ethiopia.*

Wan Phra Is Cleanup Day

Every "wan phra" is cleanup day in Panasnikom, Thailand. On the Buddhist weekly sabbath, the people clean their houses, the space underneath them, and their yards. The health committee roused interest in sanitation, and the resulting cleanup drive left the village spotless. Flowers and vegetables are planted in areas previously overgrown with weeds or cluttered with refuse.

Once Panasnikom's only source of drinking water during the dry season was a hole in the ground. The people walked down to the hole on rude planks and scooped up the muddy water at the bottom. Now they are building a water catch basin with shallow wells at two corners. International Cooperation Administration supplied pumps for the wells, which will be a year-round source of protected water.

The villagers themselves dug the wells and the catch basin, built the form for the well casings, and poured the casings and the slab. Sanitarians from Cholburi training center helped install the casings, slab, and pump.

—ROBERT L. ZOBEL, M.D., *chief, Public Health Division, U. S. Operations Mission, Thailand.*

Journey to Tobar Donoso

Anti-yaws campaign workers traveled for 8 days to reach the remote gold mining section of Tobar Donoso in northern Ecuador. Starting from the Colombian city of Tumace, they journeyed by railroad, boat, and pack animal into the Andes. All yaws cases and contacts in the isolated area were treated.

—JAMES D. CALDWELL, *chief, health, welfare and housing field party, U. S. Operations Mission, Ecuador.*

A Hut for the Zo

As a consequence of our classes in midwifery, the paramount chief in the small Liberian village we visited had built a hut where his wife, the head Zo, performs deliveries. In this and other villages the Gbarnga rural health unit holds classes for 135 midwives, or Zos. The classes concentrate on cleanliness, care of the umbilical cord, and recognition of abnormalities requiring medical attention.

In Sanniquellie we had a chance to compare our classes for midwives with the somewhat different system used by the hospital superintendent, a Liberian nurse who is English-trained. These Zos leave their families and villages and come to the Sanniquellie hospital for 1-4 or 15 months of experience. Except for housing, the midwives provide for all their own needs.

—JULIA WORTHINGTON, *adviser, Public Health Nursing, U. S. Operations Mission, Liberia.*

A calibration of the optical density developed on X-ray film from exposure to fission-product particles was made by using an isolated radioactive particle in the sample collected April 5, 1955. This particle of measured beta activity was used in a series of 8 exposures ranging from 5 minutes to 19 hours and in distance of particle to emulsion from 40 to 500 microns. The density (transmission) profile of a particle autoradiograph was determined with the aid of a microphotometer which viewed a film area 46 microns in diameter by means of magnification (1:10) and an aperture mask on the photocell.

Photometer readings were taken progressively from the center of the irradiated area outward until the density faded into background fog. From these readings the radiation exposures at the points of measurement were calculated (6) and used to equate the total radiation exposure received by the film. Since the radioactivity and length of exposure were known, a proportionality constant could then be calculated for each of the eight calibration exposures. The average of the eight proportionality constants was used to calculate the

radioactivity of air particulates from their autoradiographs. The calculated activity of a radioactive particle was then extrapolated from decay data to the activity at the midpoint of the collection time.

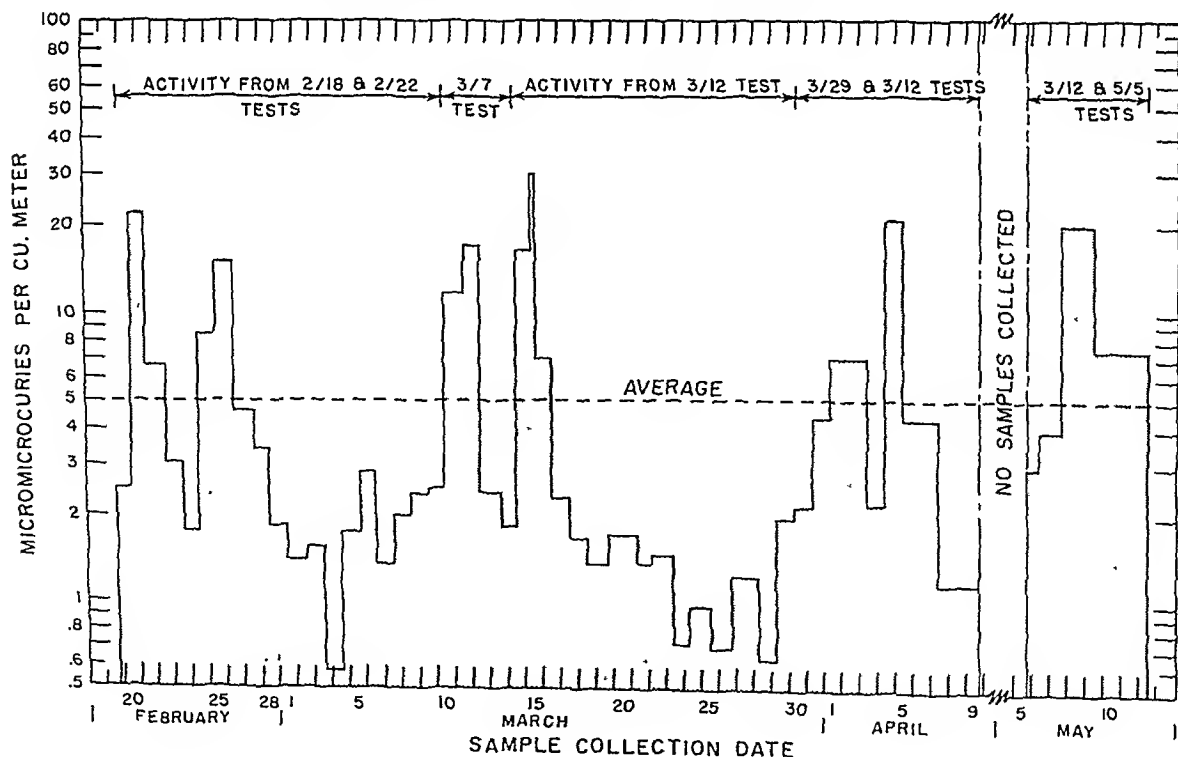
Autoradiographs of the more active particles, those which had an activity at mid-collection time greater than about 5 micromicrocuries ($\mu\mu\text{c.}$), were measured in this manner.

The minimum detectable activity by autoradiographic technique varies roughly as the square of the distance between the particle and the film emulsion. For a particle exposed for 24 hours and spaced 100 microns from the emulsion, the minimum detectable activity was estimated to be roughly 1 $\mu\mu\text{c.}$ All particles having an estimated radioactivity of less than 5 $\mu\mu\text{c.}$ were counted under a low-power microscope, and each was assumed to have an average activity of 2.3 $\mu\mu\text{c.}$

Gross Beta Activity

The gross beta radioactivity of particulate matter in each air sample is shown in figure

Figure 2. Gross beta activity of atmospheric particulates, Cincinnati, 1955.



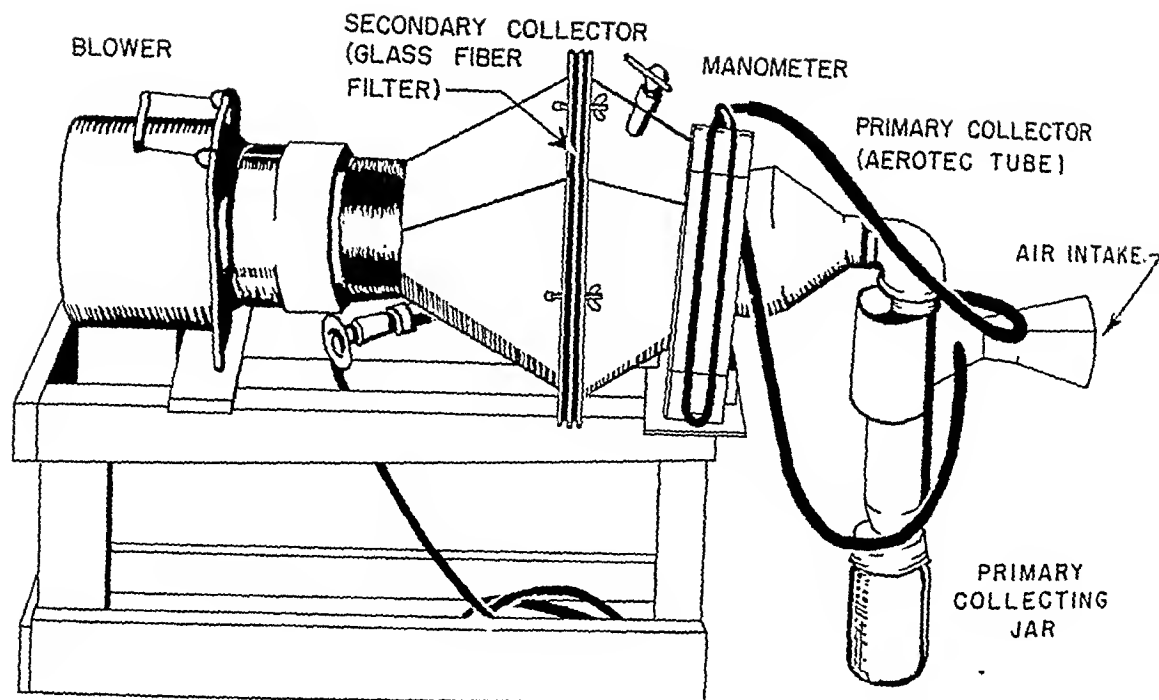


Figure 1. Air sampler used in Cincinnati study of atmospheric radioactivity, 1955.

19 through April 9 and again from May 5 through May 12, sampling was continuous except for changing filters and emptying the cyclone separator. Samples were collected daily (20-28 hours) except for one 3-hour sample, four 2-day samples, and one 3-day sample (indicated by the width of the bar graphs in fig. 2).

After each collection the dust in the cyclone separator was removed with 100 ml. each of distilled wash and rinse water. Ten percent (20 ml. of the combined wash and rinse water) was filtered through a cellulose acetate membrane filter (*B*) for counting and autoradiographing the samples collected through March 22 and the sample collected on April 3. The filtrate, containing the soluble activity from the primary fraction, was evaporated to dryness in an aluminum dish (2 inches in diameter) and similarly counted in an internal counter. Twenty-milliliter aliquots of the primary fraction of all other samples were evaporated in dishes without filtration and counted, but no autoradiographs were made. Repeat counts of some samples were made to establish radioactive decay rates.

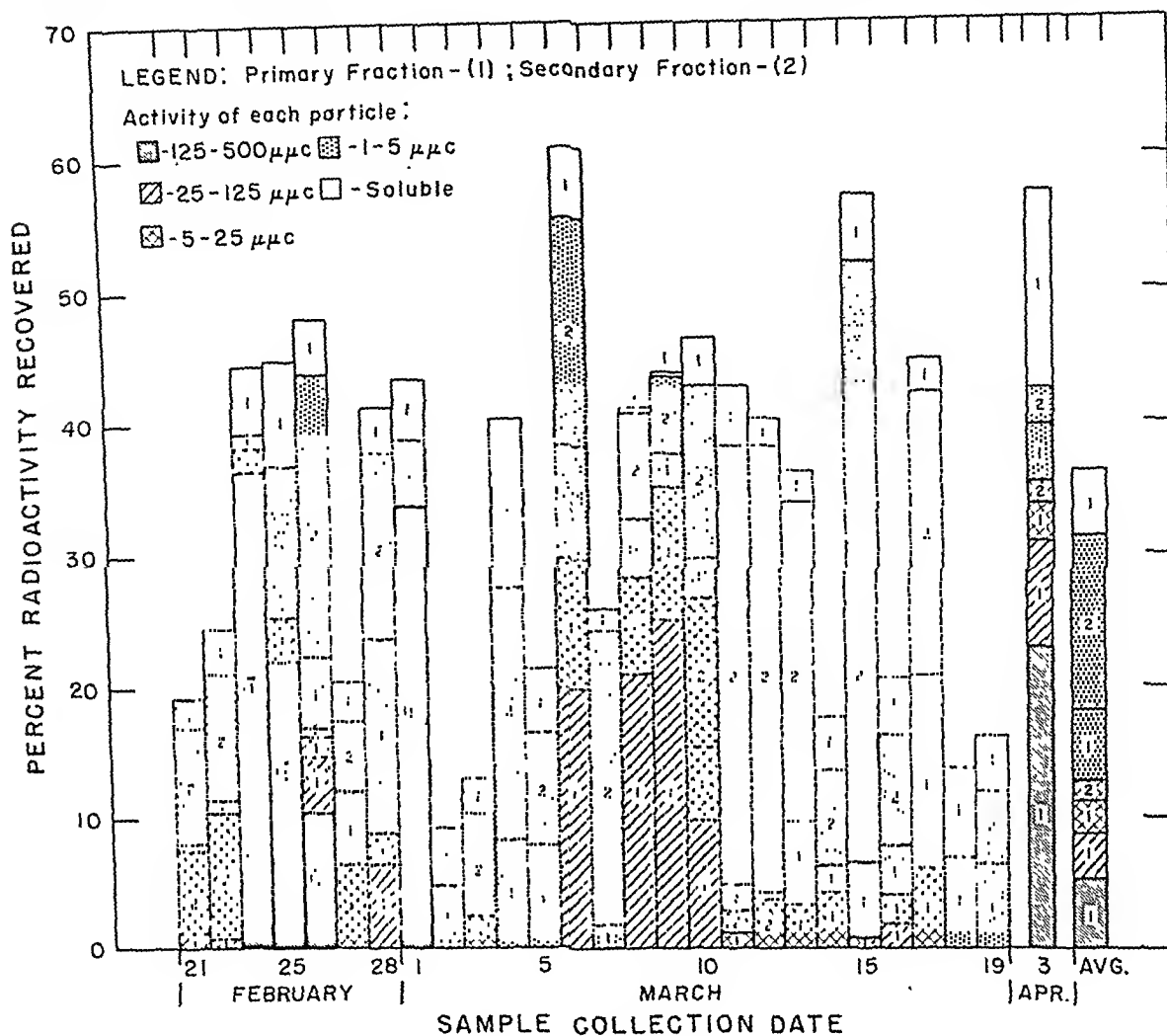
For assay of the secondary fraction, a 1 $\frac{1}{8}$ -

inch diameter circle ($\frac{1}{23}$ of the total filter area) was punched from the center of the glass fiber filter, counted in an internal proportional counter, and used for autoradiography.

The samples were held at least 4 and usually 16 or more hours after collection to permit decay of radon daughter activity ($T_{1/2}=38$ minutes) before the beta-gamma mixed fission product activity was counted in an internal gas-flow proportional counter having an efficiency of 50 percent (3-5). The measured activity of a sample was corrected for decay to the midpoint of the collection time from decay data or by the application of the exponential decay factor of -1.2 for fission-product activity formed on the most probable test date.

One to four days after collection, six membrane or glass-fiber filter samples were glued face up on a 5- x 7-inch sheet of paper. The sheet was then inverted on top of the emulsion of an X-ray film (*C*). A sponge rubber pad mounted on a 5- x 7-inch piece of plywood was placed on the inverted paper and weighted with a 16-lb. brick. The film was usually exposed for 20 to 25 hours before development for normal contrast with standard X-ray chemicals, according to the manufacturer's directions.

Figure 4. Radioactivity of particles as measured by autoradiographs, Cincinnati, 1955.



as many radioactive particles appeared on the 3-day autoradiographs as on the corresponding 24-hour film exposures. Thus, prolonged film exposure reveals a preponderance of particles with less than 1 $\mu\mu\text{c}$. of activity. It will be shown (fig. 4 and the table) that a large percentage of the total beta activity is not accounted for by the autoradiographic technique. It is likely that an appreciable part of the low-level activity from discrete particles merely increases the background fog of a 24-hour film exposure.

The particle with an estimated radioactivity of 1,700 $\mu\mu\text{c}$. was found in 10 percent of the primary fraction of the 24-hour sample collected at noon April 5. Subsequent autoradio-

graphs of the entire primary sample did not reveal any more particles of activity exceeding 500 $\mu\mu\text{c}$. The 1,700- $\mu\mu\text{c}$. particle was isolated from the mass of nonradioactive particles in the sample. It was a reddish, semitransparent, nearly spherical particle having a diameter of 7.5 microns. Its decay and absorption data were characteristic of 8-day-old mixed fission product.

Distribution and Frequency

On the basis of estimates obtained either photometrically or by microscopic examination, the particles were grouped into five ranges of beta activity. The percentage distribution of

2. (Gross beta activity is counted at an efficiency of 50 percent and includes gamma activity which is counted at an efficiency of 1 to 3 percent.) The lower level of beta activity found in 5 daily samples collected February 19 or later and the 2 collections made a few days before that date (not shown in the chart) ranged from 0.3 to 1 $\mu\text{c.}$ per cubic meter ($1 \mu\text{c.}/\text{m.}^3 = 10^{-12} \mu\text{c.}/\text{ml.}$). The remaining 44 samples had an activity between 1 and 30 $\mu\text{c.}$ per cubic meter. Eight samples had an activity exceeding 10 $\mu\text{c.}$ per cubic meter. The average activity of all samples was approximately 5 $\mu\text{c.}$ per cubic meter.

The highest levels of activity observed in this study appeared 2 to 4 days following the reported detonation of nuclear devices in Nevada. Decay data of the air particulate samples and some rain samples were used to identify the radioactivity with specific nuclear weapons tests, as shown in figure 2.

The beta activity of particles in the primary fraction ranged from 0.08 to 17 $\mu\text{c.}$ per cubic meter, with an average of 1.7. The minimum value was found in the sample collected February 17. The activity of this sample had a half-life of several months. The maximum activity of a single particle was 1,700 $\mu\text{c.}$, found in the April 5 sample. This was the particle used for calibrating the autoradiographic technique.

Of the average activity of 5 $\mu\text{c.}$ per cubic meter in air particulates, an average of 1.7 $\mu\text{c.}$, or 34 percent of the total, was found in the primary fraction. Based on 28 samples available for comparison, from 1 to 41 percent, or an average of 16 percent, of the activity in the primary fraction was dissolved in the water used to remove the particles from the cyclone separator.

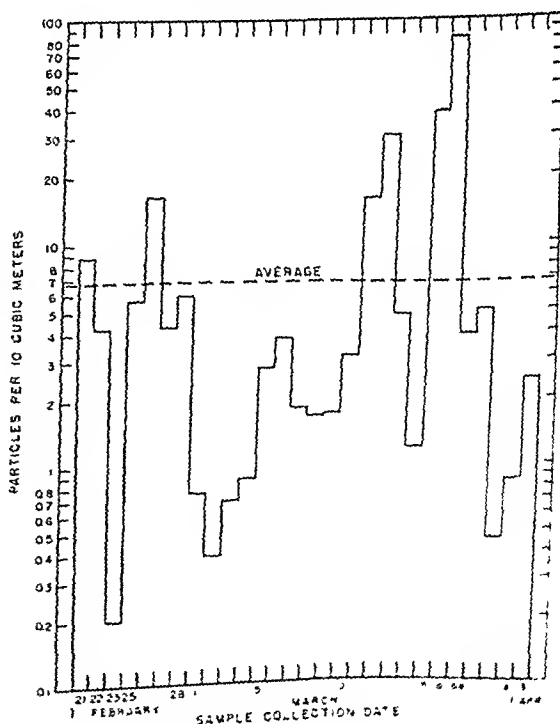
Autoradiographic Assay

Both the primary and secondary fractions of most of the samples collected from February 21 through March 19 and the sample collected on April 3 were autoradiographed after separating the water-soluble activity in the primary fraction. The autoradiographs revealed 106 active particles which were measured by photometry and 2,084 particles detected by microscopic examination.

The number of radioactive particles of variable beta activity represented an extremely small percentage of the total particles in the air, but, considering that a single person inhales 15 to 20 cubic meters of air daily, the particle radioactivity may have health significance. The variation in the number of radioactive particles in the 28 samples assayed by the autoradiographic technique is presented in figure 3. Excluding the samples of February 23 and March 1, for which only the primary fraction particles are given, the bar graph shows that all but 5 of 26 samples contained more than 1 radioactive particle per 10 cubic meters. In 5 samples there were from 16 to 82 radioactive particles per 10 cubic meters, as compared with a 26-sample average of 6.7 and a median of 4.

The beta activity of these particles ranged from an estimated minimum of 1 $\mu\text{c.}$ for detection by a 24-hour film exposure up to 1,700 $\mu\text{c.}$ for the most active particle. Three-day film exposures were also made on the samples collected February 21 and 22. About 3 times

Figure 3. Frequency of radioactive particles, Cincinnati, 1955.



man. The rest would penetrate into the alveoli of the lungs. Presumably 50 percent might lodge in lung tissue for a variable time. Most of the particles in this secondary fraction had an activity of less than 5 $\mu\mu\text{e}$. per particle.

Some of the particles found in the primary fraction, however, might reach lung tissue. Some of these particles had much higher radioactivity than the secondary fraction particles. One particle with an activity of 1,700 $\mu\mu\text{c}$. had a diameter of 7.5 microns. Its size was such that if the particle were inhaled it would have a finite chance of reaching the alveoli. Once there, the particle would probably remain to cause considerable radiation damage to local lung tissue. When inhaled the smaller particles are more likely to reach lung tissue, but they may be eliminated by several mechanisms (8-11).

Summary

Radioactive particles found in air samples collected in Cincinnati following nuclear detonations in Nevada were separated into two size-fractions representative of particles retained by the upper and the lower respiratory system of man. Air sampling was continuous from mid-February until early April and again for 1 week in May 1955.

Measurements by autoradiographs and gross internal proportional counting indicated that:

1. The maximum, minimum, and average concentrations of beta activity in 47 samples collected between February 16 and April 9 and 4 samples collected between May 5 and May 12 were 30, 0.35, and 5 $\mu\mu\text{c}$. per cubic meter of air, respectively. For comparison, the maximum permissible level for unknown radioisotopes beyond the control area is 1,000 $\mu\mu\text{c}$. per cubic meter of air.

2. The average number of radioactive particles per 10 cubic meters of air was 6.7 in 26 samples collected between February 21 and March 19 and on April 3. The weighted average beta activity of these samples was 37 $\mu\mu\text{c}$. per 100 cubic meters of air. One sample contained as many as 80 radioactive particles and a beta activity of 300 $\mu\mu\text{c}$. in 10 cubic meters of air.

3. The more radioactive particles were col-

lected by a cyclone separator, which simulates capture of particles by the nasal passages and bronchial tubes. Generally these particles would be rapidly eliminated from the human system. In roughly half of the samples tested, these particles had a gross beta activity of 25 to 500 $\mu\mu\text{c}$. and one isolated particle of 7.5 micron diameter had an activity of 1,700 $\mu\mu\text{c}$.

4. The activity of particles caught on the filter, representing material which would penetrate to the lung alveoli, was usually less than 5 $\mu\mu\text{e}$. and did not exceed 25 $\mu\mu\text{e}$. per particle.

EQUIPMENT REFERENCES

- (A) Acrotec tube, design 2, Thermix Corp., New York, N. Y.
- (B) Millipore filter, type HA, Millipore Filter Corp., Watertown, Mass.
- (C) Blue Brand X-ray film, Eastman Kodak Co., Rochester, N. Y.

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activity in each fraction and in each radioactivity range as related to the total radioactivity of each daily sample is shown in figure 4. Particles containing 125-500 $\mu\text{mc.}$ were found only in the primary fraction of five samples. It is estimated that 10 to 37 percent of the total activity of these 5 individual samples resided in the "hot" particles. The samples collected March 8 and 9 each had particles with activities of 25 to 125 $\mu\text{mc.}$, which accounted for 20-25 percent of their radioactivity and were recovered from the primary fraction. A considerable portion of particles in the primary fraction also had a radioactivity of 1 to 25 $\mu\text{mc.}$

The activity of particles in the secondary fraction was usually less than 5 $\mu\text{mc.}$ per particle, but 6 samples had secondary-fraction particles having an activity of 5 to 25 $\mu\text{mc.}$ Figure 4 shows that at most only 61 percent of the total radioactivity of a sample was observed by the autoradiographic technique. This may be explained as follows: (a) the secondary fraction of three samples was not autoradiographed; (b) particles having an activity of less than about 1 $\mu\text{mc.}$ contributed only background fog to the X-ray films and this activity could not be measured; (c) the assumed average activity of

2.3 $\mu\text{mc.}$ for particles having an activity of 1-5 $\mu\text{mc.}$ each may be an underestimate; and (d) the autoradiographic technique is at best a rough estimate of particle radioactivity.

The results are further summarized in the table to show the frequency of occurrence of radioactive particles in the atmosphere tested. The most radioactive particle found (1,700 $\mu\text{mc.}$) had a diameter of only 7.5 microns. It appeared in the primary fraction and theoretically would occur at a frequency of 6 particles per 1,000 cubic meters of air, whereas a maximum of 13 and an average of 1.5 particles having an activity of 125-500 $\mu\text{mc.}$ would occur per 1,000 cubic meters of air. The great preponderance of radioactive particles were found to have low activity levels of 1-5 $\mu\text{mc.}$; they were much more abundant in the secondary fraction. There were no particles in the secondary fraction which had an activity exceeding 25 $\mu\text{mc.}$

Of the radioactivity in each fraction an average of 57 percent was accounted for by autoradiography in the primary fraction, and an average of 23 percent was accounted for by autoradiography in the secondary fraction. Considering the radioactivity of both fractions, a maximum of 61, a minimum of 9, and an average of 36 percent of the total radioactivity was accountable by the autoradiographic technique.

Occurrence of particles of given radioactivity, Cincinnati, 1955

| Particle activity range, $\mu\text{mc.}$ | Primary fraction | | Secondary fraction | |
|---|------------------|---------|--------------------|---------|
| | Maximum | Average | Maximum | Average |
| Number of radioactive particles per 10 cubic meters of air | | | | |
| 1-5----- | 8 35 | 1 17 | 73 5 | 5 2 |
| 5-25-- | 38 | 12 | 1 5 | 16 |
| 25-125 | 13 | 025 | 0 | - |
| 125-500 | 13 | 015 | 0 | - |
| 1,700 --- | 1 06 | ----- | 0 | -- |
| Percentage of fraction radioactivity in discrete particles ² | | | | |
| 1-500 - | 89 | 57 | 51 | 23 |

¹ One particle in 10 percent of sample had a diameter of 7.5 microns and an activity of 1,700 $\mu\text{mc.}$

² Based on autoradiographic technique employing 24-hour film exposure and, in the case of the primary fraction, its soluble activity which varied from 1 to 41 or an average of 16 percent of the total primary activity.

Discussion

The maximum concentration of gross beta activity of 30 $\mu\text{mc.}$ per cubic meter of air in the samples collected in this study was far below the 1,000 $\mu\text{mc.}$ per cubic meter of air listed by the National Committee on Radiation Protection and Measurement as the provisional level for "permissible concentration of unknown mixtures of radioisotopes in the air . . . beyond the areas that are under the control of the installation responsible for the contamination." This value set by the committee is believed "to be safe for exposure to any of the radioisotopes for periods of a few months" (7).

About one-third of the total radioactivity of the air particulates collected in Cincinnati, that found in the primary fraction, would probably be retained in the upper respiratory system of

Diphtheria in the United States in 1956

HELEN A. MOORE, M.D.

DURING the autumn of 1955 and the early winter of 1955-56, diphtheria occurred in the Nation with a frequency not witnessed for a number of years. Fear of a definite resurgence was aroused when outbreaks occurred in areas which had been almost entirely free of the disease for extended periods. The particularly high incidence of the disease in the southeastern States has been described in a previous report (1) prepared at the close of 1955. It is the purpose of this paper briefly to summarize the United States diphtheria experience in 1956.

Data on the occurrence of diphtheria cases and deaths were obtained primarily from publications of the Public Health Service's National Office of Vital Statistics, *Morbidity and Mortality Weekly Reports* and their annual supplements and *Vital Statistics of the United States*. More detailed information was obtained from current communicable disease reports prepared by States for internal use and from the annual communicable disease statistics published by most States. Additional details were collected by personnel of the Communicable Disease Center in connection with field assignments which dealt directly or indirectly with diphtheria. The assembling and review of such data are continuing functions of the Surveillance Section of the Center.

The occurrence of diphtheria in 1955 and 1956, by weeks, is given in figure 1, and the States contributing heavily to the weekly peaks are also indicated. During the first half of 1956 diphtheria incidence continued to be relatively high and was above that of the preceding

year in about two-thirds of all weeks. Following the seasonal low, however, the expected pattern of early increase of diphtheria cases in the southern States did not develop to the usual extent. Incidence remained well below that of 1955 throughout the fall and winter, and at the close of the year 1,581 cases had been tentatively reported, compared with 2,039 cases in 1955. Data for 1956 in figures 2 and 3 and table 1 are also preliminary. Although final figures for 1956 are now available, they do not alter the pattern or change the conclusions since they change the total by less than 1 percent.

This 22 percent decrease in the incidence of diphtheria restores somewhat the trend of the last decade. After the last increase in reported diphtheria in 1945 there was a fairly steady decline at about 25 percent per year until 1953. In this year the decrease was only 20 percent. In 1954 it was 13 percent and in 1955 only 3 percent. The small drop in cases for the calendar year does not give as clear a picture as the statistics for the disease years. For the disease season of 1955-56, there was actually a 12 percent increase over the disease year 1954-55. The decline in cases in the calendar year of 1956 was due almost entirely to decreases in the last half of the year and in the southeastern States.

In figure 2 and table 1, diphtheria morbidity rates are shown by standard geographic divisions and by States for 1949-56. The areas showing the greatest decline in 1956 were the South Atlantic and East South Central States. Small decreases, or essentially no change, occurred in all other divisions except the East North Central and the Mountain States, which showed increases of 0.6 cases per 100,000 population.

The increased rate in the East North Central division is almost entirely due to increases in

Dr. Moore is chief of the Diphtheria Unit, Surveillance Section, Communicable Disease Center, Public Health Service, Atlanta, Ga.

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Regional Medical Directors Reassigned

The Public Health Service has announced a series of changes among medical directors assigned to the regional offices of the Department of Health, Education, and Welfare. The changes will become effective July 1, 1958.

Dr. Francis J. Weber, medical director of Region 8, with headquarters in Denver, Colo., has been appointed chief of the Service's newly created Division of Radiological Health in Washington, D. C.

Dr. Michael Pescor, present medical director of Region 7, with headquarters in Dallas, Tex., will become medical director of the Denver office.

Dr. Richard Boyd, now medical director of Regions 1 and 2, stationed in New York City, will assume the same position in the Dallas office.

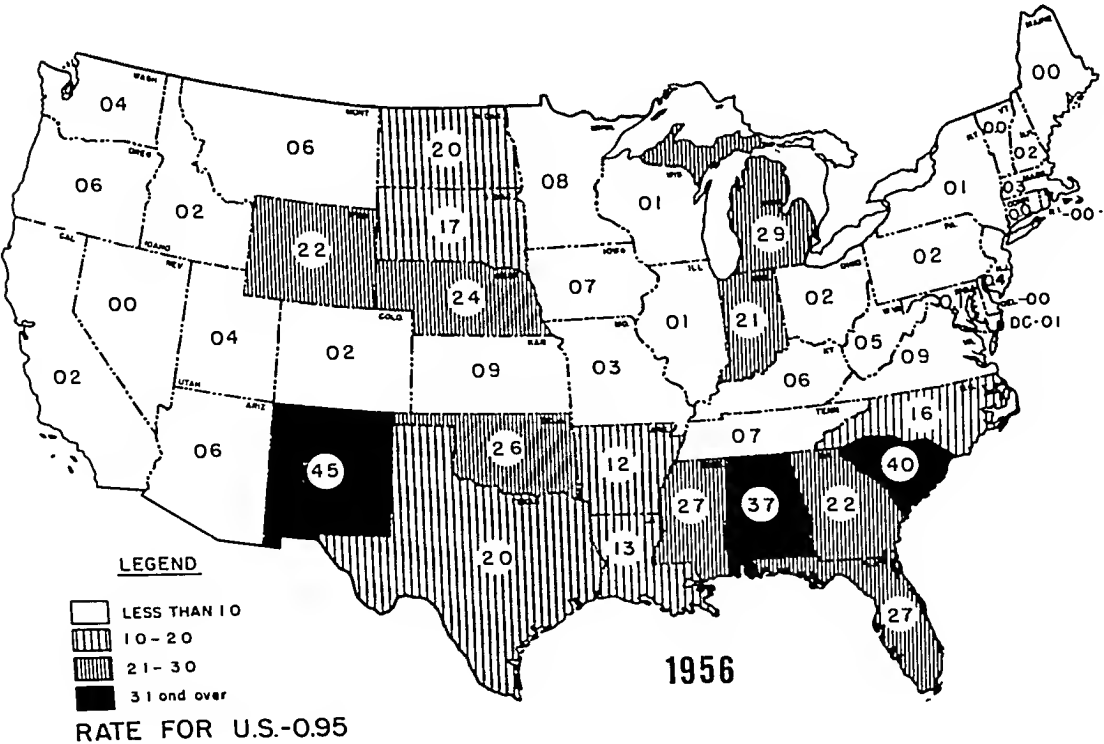
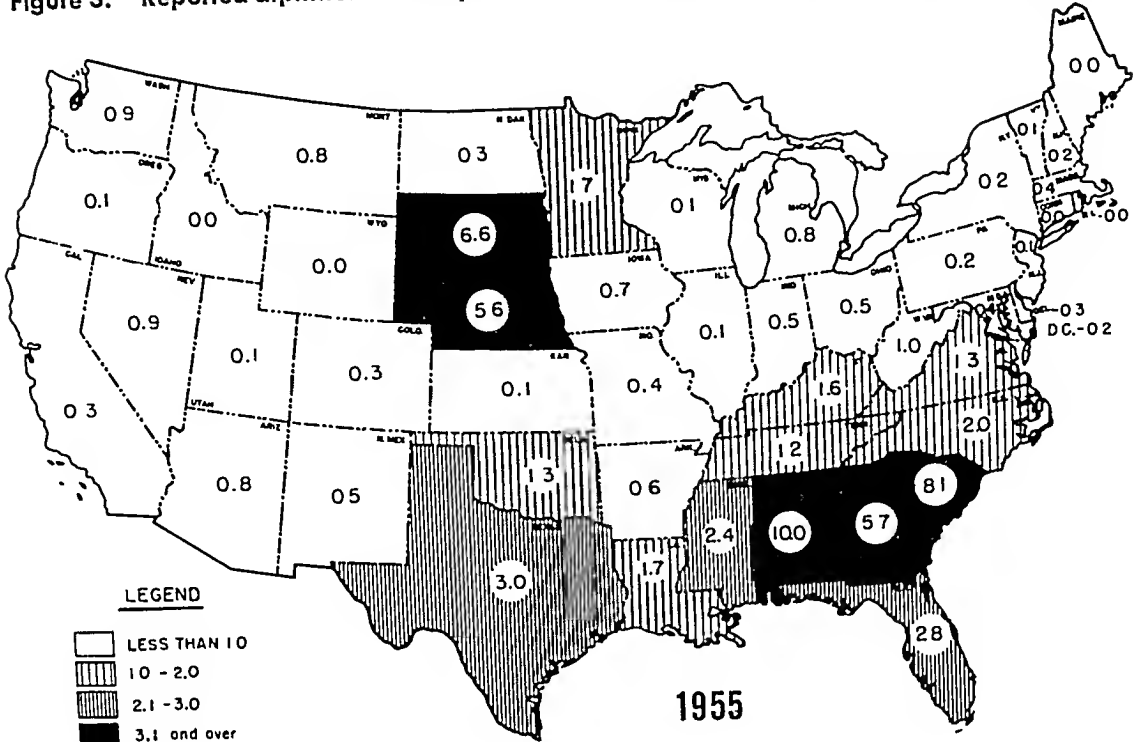
Dr. Harald M. Grauning, medical director of Region 5, in Chicago, will move into the New York City position.

Dr. Arthur B. Price, at present on loan from the Public Health Service to the Bureau of Old-Age and Survivors Insurance, Social Security Administration in Baltimore, will become the medical director of the Chicago office.

The medical directors of other regions are: Dr. Eugene Gillis, Region 3, Charlottesville, Va.; Dr. Will H. Aufranc, Region 4, Atlanta, Ga.; Dr. Lewis H. Hoyle, Region 5, Kansas City, Mo.; and Dr. Charles F. Blankenship, Region 9, San Francisco.

The medical directors in the regional offices direct Public Health Service programs of grants and technical assistance and other relationships with the States and Territories that comprise each region.

Figure 3. Reported diphtheria cases per 100,000 population, United States, 1955 and 1956.



the States of Michigan and Indiana (fig. 3 and table 1). The rise in the Mountain States is attributable to an increase of 4 cases per 100,000 population in the reported incidence of diphtheria in New Mexico.

The prominence of the southern States in the persistent reporting of diphtheria is not greatly changed. In 1955, 74 percent of the Nation's cases were reported from the three southern divisions. In 1956, only 57 percent of the total occurred in this area but, again, this change only restores a previous relationship which was exaggerated in 1955.

Brief descriptions of diphtheria experience from localities (counties) reporting 10 or more diphtheria cases in 1956 are found in table 2. A county rate of 20 per 100,000 is used as a demarcation so that such local rates occurring in 1956 may be compared with those of 1955, as previously reported (1). In 1955, 19 localities had rates of 20 per 100,000 or higher. In 1956, only 9 localities reported cases at this or a higher rate.

A distinct localization of these sharp disease

episodes to the area east of the Mississippi River and south of the Ohio River was noted in 1955. Fourteen of the 19 outbreaks occurred in this area. In 1956, only three episodes occurred in

Figure 2. Reported diphtheria cases per 100,000 population, by major geographic divisions of the United States, 1949-56.

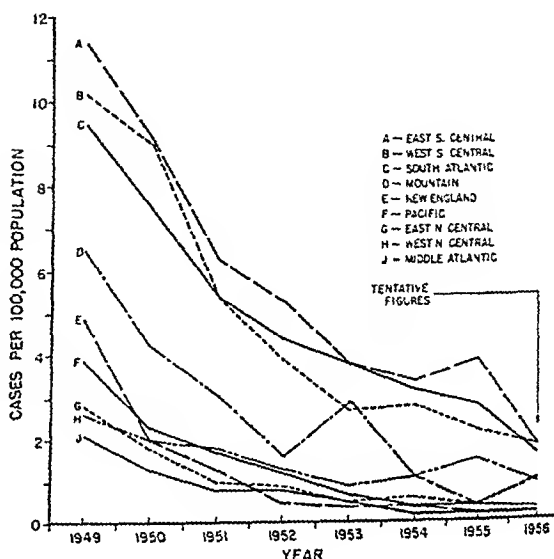


Figure 1. Reported diphtheria cases in the United States, by week of report, 1955 and 1956.

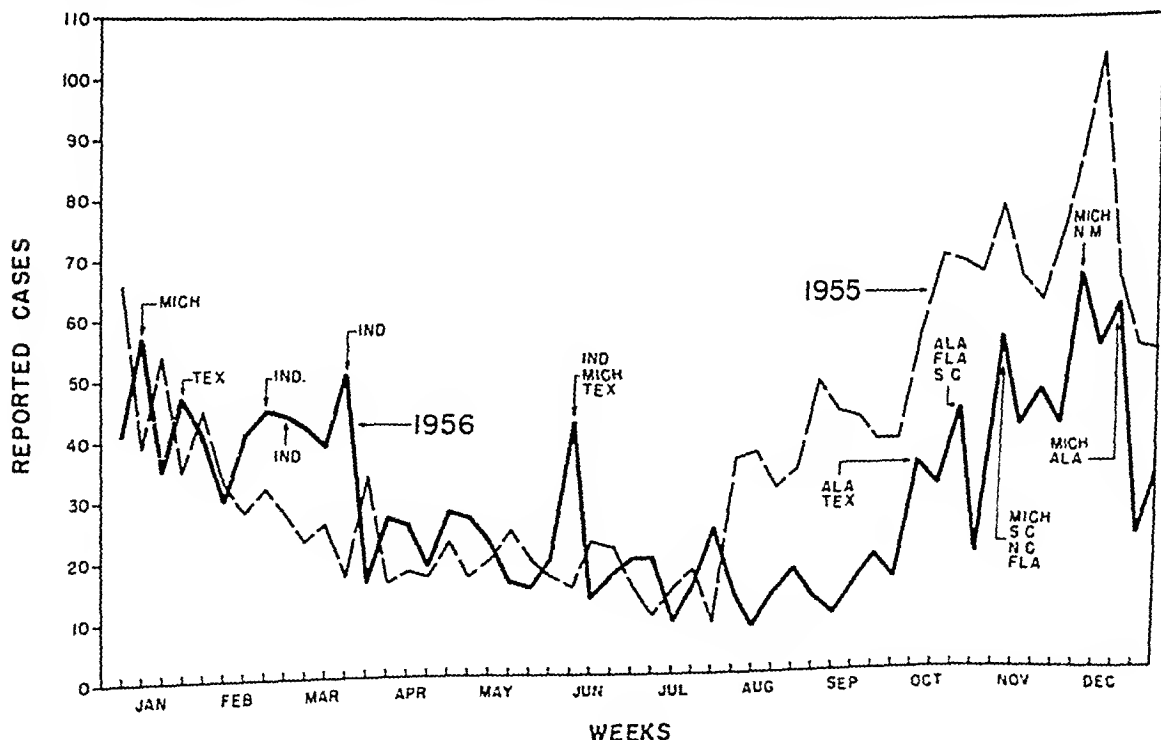
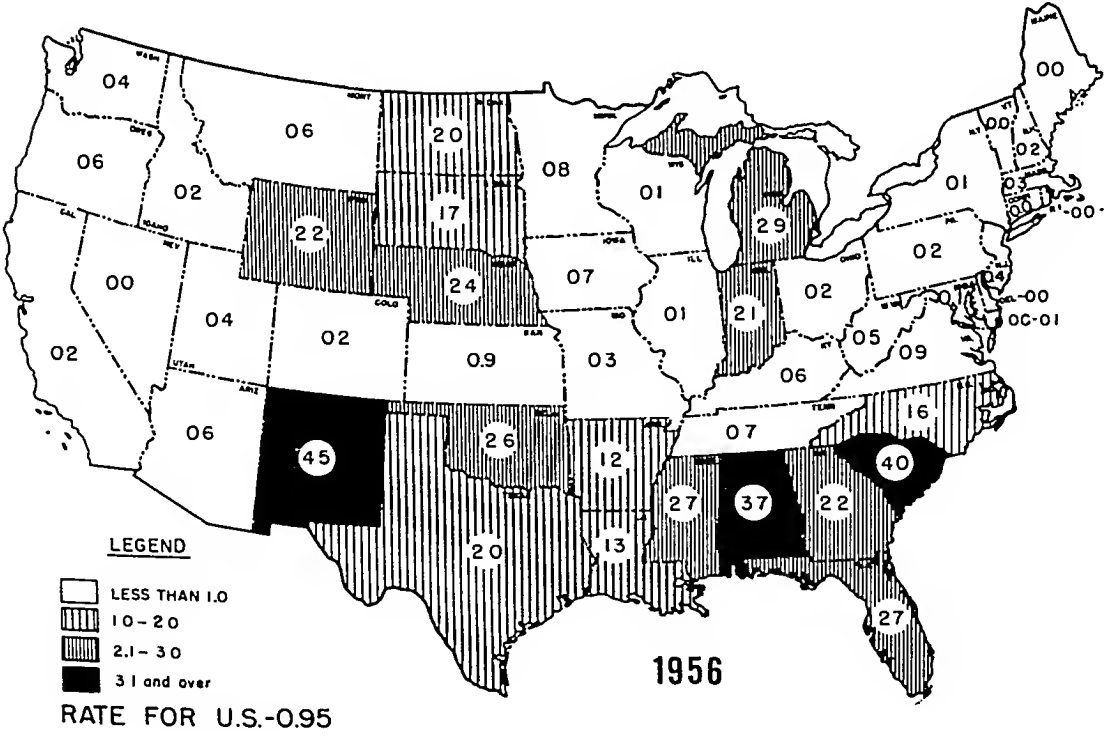
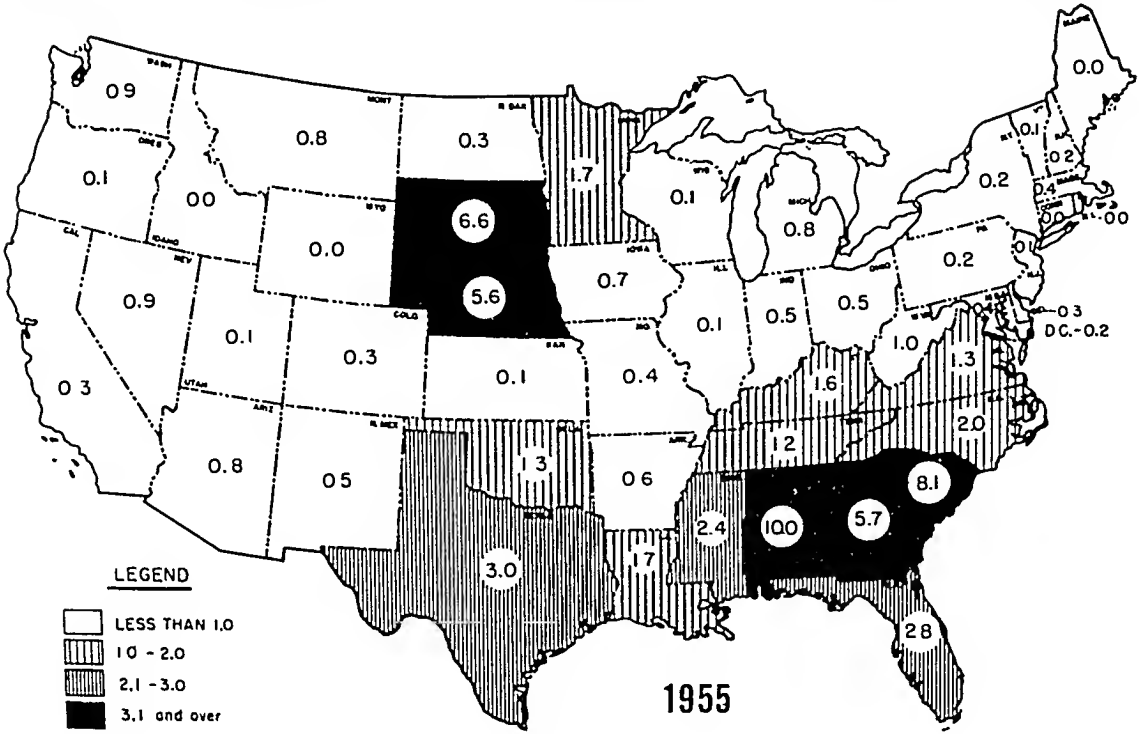


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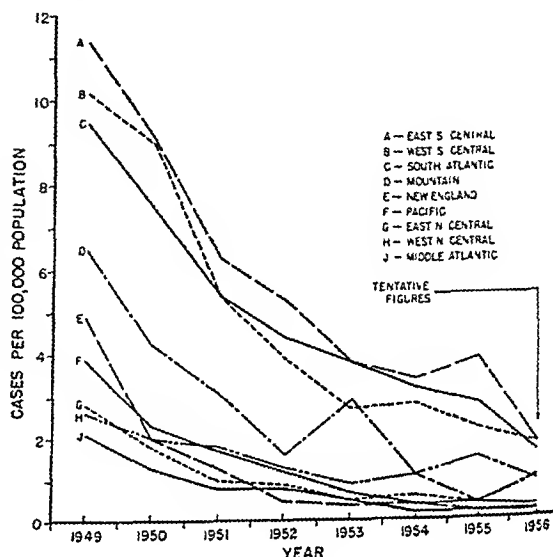


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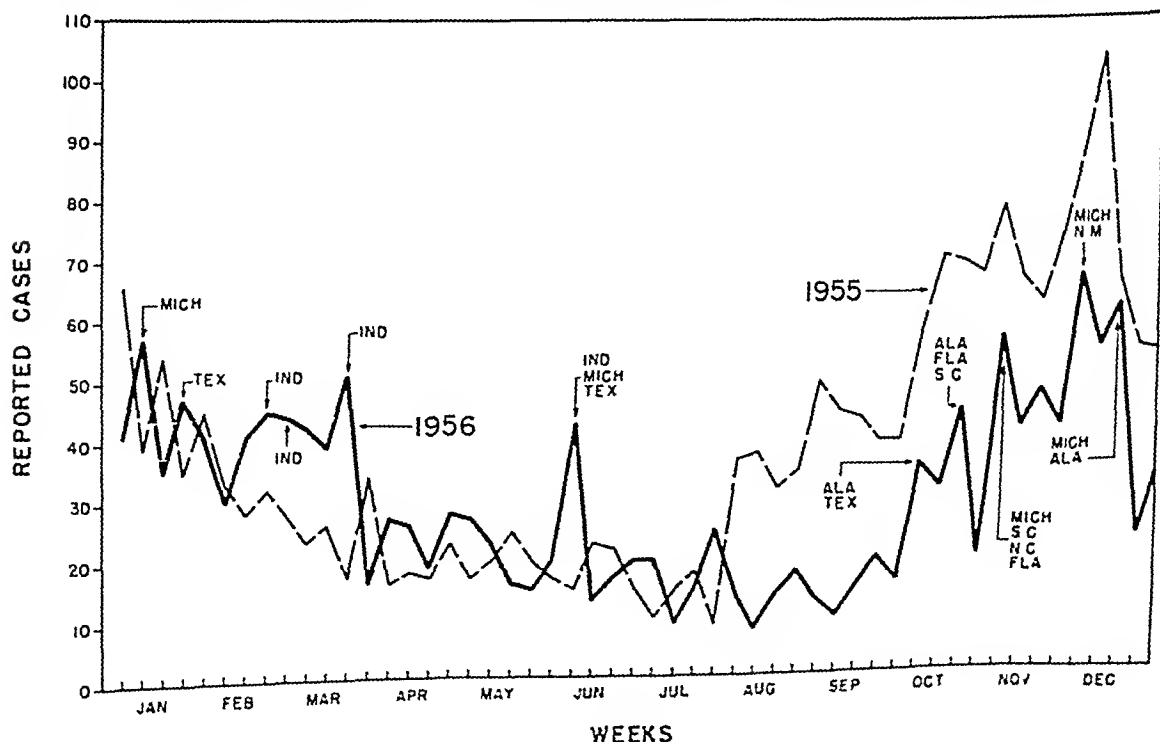


Table 2. Counties reporting 10 or more diphtheria cases per 100,000 population, United States, 1956

| Time | State | County | Cases | Rate | Remarks |
|--|---------------------|-------------------|-------|-------|--|
| <i>Over 20 cases ¹</i> | | | | | |
| February-April----- | Indiana----- | La Porte----- | 54 | 70.3 | 49 cases from nonofficial reports. 26 cases within Michigan City. 23 cases in adjacent rural areas. Sharp increase from 0 cases in 1955. |
| March-April----- | Indiana----- | Porter----- | 10 | 25.0 | 12 cases from nonofficial reports. All from rural area adjacent to Michigan City. Increase from 0 cases in 1955. |
| February-April----- | Oklahoma----- | Pittsburgh----- | 13 | 31.7 | Increase from 8 cases in 1955. |
| May-June----- | Texas----- | San Patricio----- | 10 | 27.9 | Increase from 2 cases in 1955; 6 cases in 1954. Adjacent to Nueces County below. |
| October-November----- | Alabama----- | Calhoun----- | 18 | 22.6 | Increase from 1 case in 1955. |
| November-December----- | New Mexico----- | Chaves----- | 14 | 34.5 | Increase from 0 cases in 1955. |
| October and scattered cases. | South Carolina----- | Charleston----- | 43 | 26.1 | Continuation of an episode which began in 1955. Decrease from 99 cases in 1955. |
| Around the calendar----- | Texas----- | Hidalgo----- | 38 | 23.7 | Continuation of an episode which began in 1955. No change in cases or rate. |
| Around the calendar----- | Georgia----- | Pickens----- | 12 | 135.5 | No case confirmed in the laboratory. Very unusual distribution in time for area of low population density. |
| <i>Under 20 cases ¹</i> | | | | | |
| January-February----- | Michigan----- | Kalamazoo----- | 11 | 8.7 | Increase from 1 case in 1955. |
| February-March----- | Minnesota----- | Hennepin----- | 11 | 1.6 | Essentially no change from 1955. |
| February-April----- | Michigan----- | St. Clair----- | 18 | 19.7 | Increase from 5 cases in 1955. |
| May-June and scattered cases. | California----- | Los Angeles----- | 12 | 1.0 | Essentially no change from 1955. |
| May and November----- | New Jersey----- | Mercer----- | 12 | 5.2 | Increase from 0 cases in 1955. |
| September-October and scattered cases. | Texas----- | Nueces----- | 20 | 12.1 | Sharp increase from 1 case in 1955. Reported 30 cases in 1954. |
| October-November and scattered cases. | Alabama----- | Mobile----- | 10 | 4.3 | Decrease from 19 cases in 1955. |
| October-December and 1957. | Michigan----- | Wayne----- | 172 | 7.1 | Sharp increase from 27 cases in 1955. Two distinct areas of Detroit involved and 2 different types of organisms found. |
| October-December and scattered cases. | Alabama----- | Jefferson----- | 18 | 3.2 | Decrease from 51 cases in 1955. |
| November----- | Kansas----- | Wyandotte----- | 12 | 7.3 | 9 cases from one school. Children were 67 percent Schick negative. Increase from 0 cases in 1955. |
| November-December----- | New Mexico----- | Bernalillo----- | 15 | 10.3 | 22 cases from nonofficial reports. 21 cases from circumscribed area in city of Albuquerque. |
| Around the calendar----- | Florida----- | Hillsborough----- | 24 | 9.6 | Increase from 11 cases in 1955. |
| Around the calendar----- | Nebraska----- | Douglas----- | 21 | 7.5 | Continuation of an episode which began in 1955. Decrease from 63 cases in 1955. |
| Around the calendar----- | Florida----- | Duval----- | 18 | 5.9 | Decrease from 26 cases in 1955. |
| Around the calendar----- | Texas----- | Harris----- | 17 | 2.1 | Essentially no change from 1955. |
| Around the calendar----- | Washington----- | King----- | 10 | 1.4 | Decrease from 19 cases in 1955. |
| Around the calendar----- | New York----- | New York----- | 21 | 1.1 | Decrease from 31 cases in 1955. |

¹ Rates on census of 1950.

Source: Statistics Section, Communicable Disease Center, Public Health Service.

verely congested and housing is generally substandard.

Of the 141 cases occurring during the outbreak period, 126, or 89 percent, were mild.

Only 15 persons were moderately or severely ill. There were four deaths. Cultures positive for *Corynebacterium diphtheriae* were obtained from 101 of the 141 patients and from many

the same area. In table 2 it can be seen that one of these (Charleston County, S. C.) was a continuation of an outbreak which began in 1955, and the current rate in Charleston County, while high, is a considerable decrease from 1955. One (Pickens County, Ga.) is of doubtful authenticity and one (Calhoun County, Ala.) appears to be an actual sporadic outbreak beginning in 1956.

The occurrence of 64 cases of diphtheria in and about Michigan City, Ind., was a particularly sharp deviation from the recent experience of the area. The same was true of the incidence in Chaves County and Bernalillo County (Albuquerque), N. Mex.

Other areas in which the incidence of 1956 was unexpectedly high were Mercer County

(Trenton), N. J., Wyandotte County (Kansas City), Kans., Hillsborough County (Tampa), Fla., and Nueces County, Tex., but probably the most marked departure from recent trends occurred in the State of Michigan. Two counties, Kalamazoo and St. Clair, experienced noteworthy increases in cases and in Wayne County (Detroit) an outbreak of considerable size took place.

Within the city of Detroit 141 cases of diphtheria occurred during October, November, and December 1956, and a total of 167 cases were reported during the year. This was a ninefold increase over the median expectancy of the last 7 years. One hundred of the cases originated in an area of six census tracts in the southwestern section of the city. The area is se-

Table 1. Geographic distribution of diphtheria in the United States, 1955 and 1956

| Geographic division and State | 1956 | | 1955 | | Geographic division and State | 1956 | | 1955 | |
|-------------------------------|--------------------|-------------------------------|--------------------|-------------------------------|-------------------------------|--------------------|-------------------------------|--------------------|-------------------------------|
| | Cases ¹ | Rate per 100,000 ² | Cases ¹ | Rate per 100,000 ² | | Cases ¹ | Rate per 100,000 ² | Cases ¹ | Rate per 100,000 ² |
| Total..... | 1,581 | 0.95 | 1,984 | 1.2 | South Atlantic—Con. | | | | |
| New England..... | 17 | .2 | 21 | .2 | Virginia..... | 32 | .9 | 45 | 1.3 |
| Maine..... | 0 | 0 | 0 | 0 | West Virginia..... | 10 | .5 | 20 | 1.0 |
| New Hampshire..... | 1 | .2 | 1 | .2 | North Carolina..... | 69 | 1.6 | 85 | 2.0 |
| Vermont..... | 0 | 0 | 1 | 0 | South Carolina..... | 94 | 4.0 | 188 | 8.1 |
| Massachusetts..... | 16 | .3 | 19 | .4 | Georgia..... | 83 | 2.2 | 210 | 5.7 |
| Rhode Island..... | 0 | 0 | 0 | 0 | Florida..... | 102 | 2.7 | 99 | 2.8 |
| Connecticut..... | 0 | 0 | 0 | 0 | East South Central..... | 212 | 1.8 | 453 | 3.9 |
| Middle Atlantic..... | 67 | .2 | 54 | .2 | Kentucky..... | 17 | .6 | 49 | 1.6 |
| New York..... | 22 | .1 | 30 | .2 | Tennessee..... | 23 | .7 | 42 | 1.2 |
| New Jersey..... | 24 | .4 | 6 | .1 | Alabama..... | 115 | 3.7 | 311 | 10.0 |
| Pennsylvania..... | 21 | .2 | 13 | .2 | Mississippi..... | 57 | 2.7 | 31 | 2.4 |
| East North Central..... | 341 | 1.0 | 136 | .4 | West South Central..... | 297 | 1.8 | 349 | 2.2 |
| Ohio..... | 21 | .2 | 43 | .5 | Arkansas..... | 22 | 1.2 | 11 | .6 |
| Indiana..... | 92 | 2.1 | 21 | .5 | Louisiana..... | 38 | 1.3 | 49 | 1.7 |
| Illinois..... | 10 | .1 | 10 | .1 | Oklahoma..... | 59 | 2.6 | 29 | 1.3 |
| Michigan..... | 216 | 2.9 | 59 | .8 | Texas..... | 178 | 2.0 | 260 | 3.0 |
| Wisconsin..... | 2 | .1 | 3 | .1 | Mountain..... | 62 | 1.0 | 25 | .4 |
| West North Central..... | 137 | .9 | 218 | 1.5 | Montana..... | 4 | .6 | 5 | .8 |
| Minnesota..... | 27 | .8 | 54 | 1.7 | Idaho..... | 1 | .2 | 0 | 0 |
| Iowa..... | 18 | .7 | 19 | .7 | Wyoming..... | 7 | 2.2 | 0 | 0 |
| Missouri..... | 14 | .3 | 17 | .4 | Colorado..... | 4 | .2 | 5 | .3 |
| North Dakota..... | 13 | 2.0 | 2 | .3 | New Mexico..... | 37 | 4.5 | 4 | .5 |
| South Dakota..... | 12 | 1.7 | 45 | 6.6 | Arizona..... | 6 | .6 | 8 | .8 |
| Nebraska..... | 34 | 2.4 | 78 | 5.6 | Utah..... | 3 | .4 | 1 | .1 |
| Kansas..... | 19 | .9 | 3 | .1 | Nevada..... | 0 | 0 | 2 | .9 |
| South Atlantic..... | 393 | 1.6 | 662 | 2.8 | Pacific..... | 55 | .3 | 66 | .9 |
| Delaware..... | 0 | 0 | 1 | .3 | Washington..... | 12 | .4 | 23 | .9 |
| Maryland..... | 2 | .1 | 12 | .4 | Oregon..... | 11 | .6 | 1 | .1 |
| District of Columbia..... | 1 | .1 | 2 | .2 | California..... | 32 | .2 | 12 | .3 |

¹ Preliminary reports.

² U. S. Bureau of the Census: Population estimates. Series P-25, Nos. 145 and 148. Washington, D. C., U. S. Government Printing Office, 1956.

Source: Morbidity and Mortality Weekly Reports (National Office of Vital Statistics), January 1, 1957; Annual Supplement, September 27, 1957.

These stinging insects, nuisances as well as agricultural pests, can be controlled through intensive and extensive measures.

The Imported Fire Ant

F. G. FAVORITE, M.P.H.

THE IMPORTED fire ant (*Solenopsis saevissima richteri* Forel) (1), of concern to agriculture in the southeastern United States, is also a public health nuisance. Its sting is almost as painful as a honeybee's and can cause an anaphylactoid reaction.

These stinging ants, now reported in North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Arkansas, Tennessee, Louisiana, and Texas, were first introduced into the United States at Mobile, Ala., around 1920 (fig. 1). Presumably the ants gained entry into the country as stowaways on vessels arriving from South America, the normal habitat of this species (2).

The imported fire ant cannot and is not being ignored. To control it, the Federal Government has designated \$2,400,000 in matching funds for States that suffer from infestations. Alabama has allocated \$155,000; Georgia, \$250,000; and bills for funds have been presented in other State legislatures. Both intensive and extensive measures will be required to halt this insect short of its geographic reproduction limit.

The imported fire ant is not unlike many other ants in general appearance, but it differs considerably in habits and microstructure. The fire ants are classed as medium sized. The worker minors, females of immature colonies, average approximately $\frac{1}{8}$ inch in length, whereas the worker majors, females, usually sterile, of mature colonies, average $\frac{1}{4}$ inch.

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The basic color varies by geographic location from rust red to dark brown.

Identification of the imported fire ant is dependent upon careful examination to separate it from closely related species of the genus *Solenopsis*. The major form of *S. geminata*, the tropical fire ant, has an extremely large head out of proportion to the rest of the body and mandibles usually without teeth. Its antennal scape (the first segment of the antenna) reaches only one-half to two-thirds the distance to the posterior margin of the head. In the major form of *S. xyloni*, the southern fire ant, the mandible usually has three teeth and its antennal scape does not extend beyond two-thirds the distance to the posterior margin of the head.

The major form of *S. saevissima richteri*, the imported fire ant, normally has four mandibular teeth, and its antennal scape extends two-thirds or more the distance to the posterior margin of the head (fig. 2).

Biology

The imported fire ant's nest, or mound, also identifies it, for these ants do not build an elevated mound with the central entrance common to many other species. Fire ant mounds vary in construction to suit the environment. When the colony is free to develop without interference, the mound grows to a height of 18 to 24 inches with a basal diameter of approximately 24 inches. The active mound becomes hard in texture after alternate wetting and baking from exposure. The hardened mounds have caused damage to farming equipment (3, 4).

When colonies develop in lawns where they

carriers. Two types of organisms were found and the two strains were greatly different in toxogenicity (virulence).

There had not been what could be construed as serious neglect of immunization in the area of the outbreak, although the immunization levels were not as high as in some other areas of the city. Some contiguous census tracts with the same, or lower, immunization rates were not affected by the outbreak. Again, it was demonstrated that diphtheria can occur in outbreak proportions in places where the immunization levels are at or above those currently thought to be "adequate."

Summary

1. An increase in reported diphtheria during the disease year of 1955-56 is noted. During the first half of the disease year of 1956-57, including the seasonal peak, weekly incidence was well below that in the preceding year.

2. Diphtheria morbidity rates for 1956 fell most noticeably in the South Atlantic and East South Central States. Increases were noted in the East North Central and the Mountain States.

3. Localized diphtheria outbreaks decreased

in the Southeast and increased in other areas but the total of such episodes in the Nation was lower than in 1955.

The relative absence of localized sharp outbreaks of diphtheria in rural regions of the southeastern States must account for a portion of the decrease in this area. A sparing effect from the preceding high season might be postulated; however, it has been noted that such outbreaks seldom affect the same locality or even adjacent localities in successive years. Decreases were noted also in some of the southern population centers which have been persistent foci. If this be accounted an expected cyclic variation, it is not one which has been very obvious in recent years (fig. 2).

4. The recurrence of outbreaks in northern urban centers might be taken as a fairly ominous sign; one calling for an "agonizing reappraisal" of present definitions of "adequate" immunization levels.

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Institutes on Nuclear Energy

Nine institutes on nuclear energy for engineering educators will be held in the summer of 1958 at universities and laboratories throughout the Nation. Sponsored by the Atomic Energy Commission and the American Society for Engineering Education, the institutes will provide special training in nuclear energy and the nature of nuclear reactor problems which the educators can incorporate into their teaching.

There will be 4 basic courses for those with no background in nuclear energy, 4 advanced courses, and a basic course for teachers in technical institutes. Applications for the institutes can be obtained from deans of engineering or the society's headquarters. Address W. Leighton Collins, Secretary, American Society for Engineering Education, University of Illinois, Urbana, Ill.

bles to make an incision to receive the stinger (5). My observation of stings received while preparing this study differs from these reports; discrete stings were received while the mandibular anchor was retained.

Insertion of the stinger brings immediate pain almost comparable to the sting of a honey-bee. Within several minutes a wheal, 4 to 8 mm. in diameter, appears. The stinging sensation usually subsides by the time the wheal appears. Within 24 hours a pustule, 2 to 3 mm. in diameter, forms in the center of the wheal. The pustule persists for 3 to 8 days until the purulent material is absorbed or sloughed. Each sting leaves a smooth pink area 2 to 4 mm. in diameter for several weeks until the gradual formation of scar tissue takes place (fig. 3).

During 1957 at Fort Benning, Ga., where most of my observations were made, approximately 300 persons, mainly dependents of military personnel, reported for medical care of imported fire ant stings. The majority of these persons received their stings on the lower leg and forearm while they were working or playing near their residences.

Five persons, 2 adults and 3 children, manifested anaphylactoid-type reactions. One girl reacted severely to a fifth sting, although she demonstrated no sensitivity to any of four previous stings. Following the fifth sting she suffered total body edema, cyanosis around the mouth, and respiratory embarrassment. An adult male fainted 3 times shortly after receiving 4 stings about the ankles. On examination hives were observed.

Treatment of children by parenteral route with 1:1,000 epinephrine graduated in dosage from 0.1 cc. in infants to 1.0 cc. when the child's weight exceeds 100 pounds, and of adults with 1.5 cc. of injectable benadryl solution (15 mg.) by deep intramuscular route, plus oral administration of antihistamines in both groups, has been successful in controlling most reactions to fire ant stings.

While this study was being prepared, a second instance of imported fire ant infestation of a military installation occurred at Fort McPherson, Ga., approximately 100 miles from Fort Benning. The ants were observed by a medical officer who had attended an orientation on the problem some 10 days earlier. Because



*Dr. V. J. Derbes and Dr. R. G. Jung,
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Figure 3. Fire ant stings at 72 hours.

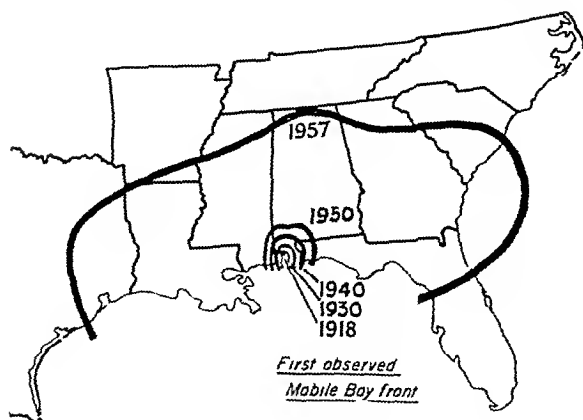
it had been quickly identified, the colony was treated while it was still immature, the majority of the ants being worker minors; it is believed that the infestation was eradicated before it had the opportunity to spread.

Even so, in the 24 hours between discovery and treatment the colony had moved approximately 4 feet from the original site. Considerable motor vehicle travel between the two military posts clearly provided a means of transportation for the imported fire ant. Local increases also occur during the spring mating season when the winged queen, having mated in flight, starts a new colony wherever she alights.

Control

Granular formulations of hydrocarbon insecticides seem to offer more promise for control than any other method. Both dieldrin and heptachlor at 5 percent concentration, spread

Figure 1. Spread of the imported fire ant in the southeastern United States, 1918-57.



U. S. Department of Agriculture

are frequently disturbed by grass-cutting equipment, the ants modify the architecture of the mound to a spreading nest, irregular in shape, covering 3 to 5 square feet, and rarely more than an inch or two high. On slopes where grass cutting is infrequent, the colonies usually select a hillock or a raised clump of weeds for the mound. When it is repeatedly disturbed or when its food supply becomes scarce, the colony moves to a new location, usually within 25 feet of the original site. Or the colony divides into 2 or 3 smaller ones, and the ants rebuild each colony to maximum strength.

Mature fire ant colonies house as many as

25,000 insects. In the colonies I observed, the greatest proportion of the ants were worker majors equipped with a pugnacious temperament and competent stinging apparatus. Several queens may be in the same colony.

In feeding habits the ants are practically omnivorous. Primary food is obtained from the seedlings, roots, and subsurface portions of plants and grasses (3-5). There are also records of ants attacking clutches of eggs, entering the pipped eggs, and feeding on the young within (4, 5).

Effect on Persons

When the fire ant mound is disturbed, the insects bubble forth in the thousands and within seconds the colony can administer 3,000 to 5,000 stings on an invader. The ants move rapidly, sting almost immediately on contact with the skin, and are prone to sting 3 or 4 times.

Normally, the ant seizes with its mandibles an anchor on a hair or the skin, quickly moves the abdomen under itself, and drives the stinger into the skin. The stinger remains implanted for 3 to 7 seconds before it is withdrawn, and the ant either pivots on its mandibular anchor or moves a short distance to repeat the stinging process. Second and third stings are usually of less duration but still quite painful.

Reports have said that the ant uses its mandi-

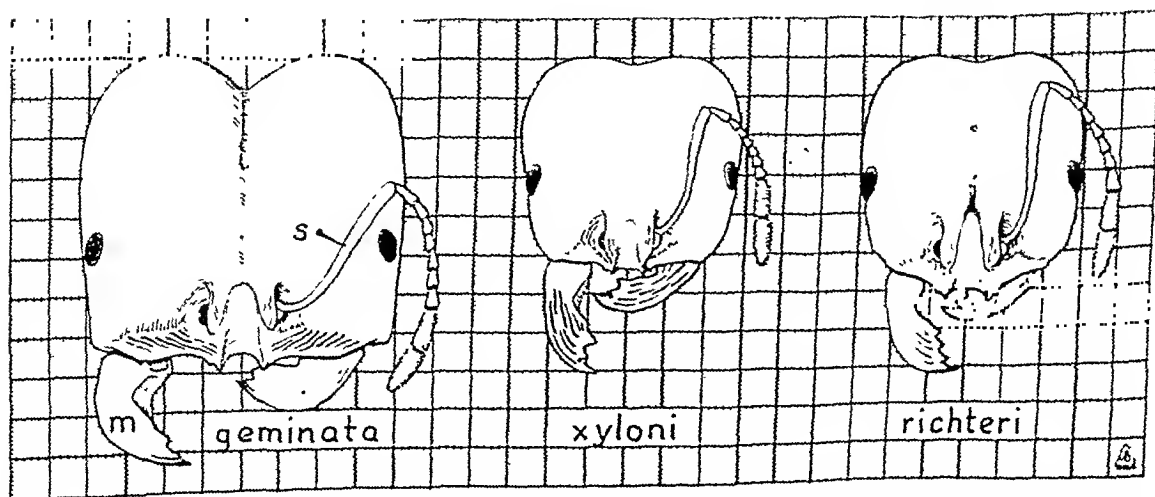


Figure 2. Distinguishing characteristics of three species of *Solenopsis*: *S. geminata* the tropical fire ant, *S. xyloni* the southern fire ant, and *S. richteri* the imported fire ant (m=mandible, s=scapel).

Mandatory Federal inspection of poultry will not eliminate all unfit poultry from the consumer market. States and municipalities have the major responsibility for regulating the poultry industry's intra-state production and distribution.

Federal and State Poultry Programs

JOE W. ATKINSON, D.V.M.

ALL GROUPS concerned agree on the need for official poultry hygiene inspection. This was demonstrated during hearings in 1956 and 1957 before five congressional committees (1-5). What makes such inspection necessary? What should its objectives be? How can those objectives be attained? Where do basic responsibilities rest, and what is the present picture in relation to those responsibilities?

The problems necessitating official poultry hygiene inspection and supervision fall under three general headings: diseased poultry, insanitary plants and products, and conditions not apparent to the consumer.

Diseased Poultry

Other workers (6-10) have dealt extensively with poultry diseases as public health problems. Therefore, it is sufficient to point out that infected birds may transmit a disease, such as psittacosis, to poultry plant employees or other persons who dress or eviscerate them, or they may serve as a source of a foodborne disease, such as salmonellosis. Consumers do not want to buy food derived from or contaminated by

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diseased birds, nor do plant employees wish to handle badly diseased poultry, even when there is no health hazard.

Diseased poultry originates, of course, at the farm or producer level. Reports in 1956 by the Committee on Poultry Diseases, American Veterinary Medical Association (11), and the Committee on Transmissible Diseases of Poultry, U. S. Livestock Sanitary Association (12), indicate the continuing nature of this problem. The latter report states:

"In reviewing the research work in the field of poultry diseases that has been done during the past year, one is aware that progress is being made, however slowly, in the knowledge and control of transmissible diseases of poultry. New problems, such as synovitis and ornithosis, increased in importance while others, such as hemorrhagic syndrome of chickens, decreased in incidence during the past year. In general, however, the major problems, such as leukosis, respiratory diseases, salmonellosis, and others, that have confronted us in the past are still the major problems of today."

Unfortunately, diseased poultry does not remain at the farm or producer level. Some of it goes to be processed and, unless rejected at that point, enters retail food channels.

While the vast majority of poultry sold for processing is healthy, a substantial amount is diseased. For example, the U. S. Department of Agriculture, under its voluntary poultry inspection program, inspected about 30 percent

at the rate of 40 pounds per acre, obtaining 2 pounds of technical material per acre, were successfully used during the summer of 1957. Chlordane has been used at the rate of 4 pounds of technical material per acre (6-8). Seeding machinery or another type of equipment which affords an even coverage can be utilized for spreading. I feel that watering the ground following treatment is essential to gain dispersion of the chemical and reduce the toxic hazard to human beings and domestic animals.

In addition, mounds should be treated individually by excavation, direct insecticide application, and watering. However, mound treatment alone cannot be relied upon for eradication. Following such treatment the ants move from the immediate area and the survivors establish a new colony.

Previously treated areas indicate that the method of spreading and treating mounds individually with insecticides will prove effective for at least 2 years (7), when preventing reinfestation may be necessary. The cost of the control program will vary with the insecticide selected, method of application, and the cost of labor in the community, but experience indicates that an average figure in the southeast would be approximately \$5 per acre.

The use of a toxic chemical introduces an-

other public health hazard, but if the chemical is applied by qualified personnel under proper supervision, the hazard can be nullified.

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Environmental Engineering Curriculum

Rensselaer Polytechnic Institute in Troy, N. Y., will offer full programs in the newly developed field of environmental engineering beginning in the fall of 1958.

At that time, a 4-year undergraduate curriculum leading to the degree of bachelor of environmental engineering and graduate courses leading to advanced degrees will be put into effect.

The object is to train engineers to meet environmental problems created by a growing population, industrial expansion, and increased urbanization.

Water conservation, food supply, air pollution control, and problems associated with the nuclear industry will be studied. Other courses will deal with industrial safety, waste treatment and disposal, housing, insect and rodent control, and research.

The new curriculum was developed in consultation with engineers and health officials at all levels of government.

eviscerating the bird or observing its evisceration, she rejected any carcass with abscesses, tumors, obnoxious exudates, badly swollen or discolored liver, or other abnormal or questionable conditions. She could also be sure that the edible carcass and giblets were not soiled with filth during evisceration.

Today, most housewives select their poultry and poultry products, either ready-to-cook or precooked, from a large variety displayed in the retail market. In addition, many servings of poultry and poultry dishes are consumed in public eating establishments. The consumer does not see the live bird or observe its processing.

So far as consumer knowledge or surveillance is concerned, abscesses, tumors, and diseased organs or parts could be removed from unfit poultry carcasses and the remainder sold as ready-to-cook poultry. Birds which are diseased, emaciated, or so altered in appearance as to be unsalable as ready-to-cook poultry can be processed, sold, and served as one of the numerous poultry dishes that preclude even an expert's evaluation of its original condition.

Similarly, insanitation may be completely hidden from the consumer. Poultry soiled by feces or other wastes can be washed off or processed so that the ultimate consumer will never be aware of the soiling, even though a seedbed of bacteria may remain (15). A good example of this is New York dressed poultry. Often grossly contaminated during chilling or other handling pending delayed evisceration, a very small proportion of such poultry actually reaches the ultimate purchaser in the uneviscerated form. Much of it is finally eviscerated in processing plants or retail markets and sold to the consumer as "fresh" ready-to-cook poultry. Most of the remainder is eventually used in various precooked poultry products or served in public eating establishments to the unaware consumer.

Other less serious but nevertheless objectionable practices may be inapparent to the purchaser. For example, frozen poultry may be defrosted and sold as "fresh." Unfrozen poultry may be held too long in distribution channels and sold to the housewife as "fresh" poultry, when in fact its freshness is substantially deteriorated and its storage life prac-

tically exhausted. Such practices have even involved products treated with antibiotics to extend storage life.

Objectives of Poultry Hygiene

In view of these problems, what should be the basic objectives of official poultry hygiene programs? Health and consumer groups agree that they certainly should provide:

- Protection of the consumer's health and interests by preventing the processing, distribution, sale, and consumption of diseased, insanitary, or otherwise adulterated poultry or poultry products.

- Assurance that poultry and poultry products have not been altered or treated to conceal inferiority, that they are factually and informatively labeled, and that they are prepared, packaged, and distributed so as to protect against contamination and spoilage to the point of purchase by the ultimate consumer.

- Protection of the health of poultry industry personnel to the fullest extent practicable.

Among the specific steps that can be taken to attain these objectives are:

1. Antemortem inspection of all poultry to be slaughtered, and elimination of birds determined to be unfit for food.

2. Postmortem inspection of each carcass and its viscera at the time of evisceration, immediately following slaughtering and defeathering.

3. Inspection of the processing of poultry pies, patties, soups, dinners, and stuffed or breaded poultry.

4. Reinspection of poultry and poultry products whenever necessary to assure continued fitness for use as food.

5. Destruction or denaturing of condemned live birds and other condemned poultry and products.

6. Supervision of sanitation in processing plants and during storage and distribution.

7. Supervision of the labeling and identification of the product.

8. Cooperation between inspection agencies and livestock disease control officials to control and prevent diseases in poultry.

9. Investigation and corrective or preventive measures when foodborne disease outbreaks are attributed to poultry, and when disease out-

of the poultry sold off farms in 1936, or more than 1.4 billion pounds. The amount rejected 11,270,951 pounds, was a little less than 0.8 percent of the total inspected. But this is a sizable amount considering the number of individual servings of poultry meat or products that could have been obtained from 11 million pounds of poultry.

What happens to diseased poultry which is processed under makeshift conditions on the farm, in retail markets, restaurants, or hotel kitchens, or in plants lacking official inspection? Obviously, the consumer has no assurance that unfit birds will be rejected in the absence of official inspection for wholesomeness. Even if financial or other personal considerations were not of primary concern to them, the persons involved seldom have the training or experience necessary to evaluate diseased poultry objectively from the health and consumer viewpoints.

A similar, related problem exists with poultry processed in the absence of continuous official supervision for sanitation.

Insanitary Plants and Products

There is some reason to believe that insanitary conditions, as well as diseased poultry, may contribute to the relatively high incidence of illness among employees in the poultry processing industry. Speaking at the Institute of American Poultry Industries Annual Fact Finding Conference in 1955, Victor Pringle, president, Associated Poultry and Egg Industries, stated: "One firm I know saved \$12,000 last year in compensation insurance, by controlling infections and skin rashes, thanks mainly to a better sanitation program throughout all parts of its plants."

It must be emphasized that far too little is known about the specific illnesses which affect poultry plant workers and the exact causative factors. According to Bureau of Labor Statistics reports, the injury frequency rate in the poultry and small game dressing and packing industry is almost three times the average of 135 manufacturing industries (13). The scope and significance of workers' health problems call for careful study and evaluation and the application of all practicable safeguards.

With respect to foodborne disease outbreaks, also, our information is incomplete. Insanitary conditions or the lack of adequate refrigeration during processing and distributing or during preparation and serving undoubtedly cause many of the outbreaks. Here, again, the application of known sanitary safeguards should be accompanied by continuing research and epidemiological studies to delineate the problem more definitely. Of course, any of a number of conditions or operations in poultry processing establishments may cause insanitary products (14). These conditions are particularly significant.

- Diseased poultry slaughtered for processing may contaminate facilities, equipment, employees' hands, and otherwise clean, healthy poultry.

- Mass contamination may occur when m-eviscerated (New York dressed) carcasses are held for delayed evisceration (15-18), particularly when chilled in water or ice slush, packed or shipped in cracked ice, or frozen and subsequently defrosted for evisceration.

- Building facilities or equipment may be inadequate for the volume or type of processing operations, making sanitation a practical impossibility. When poultry is dressed or eviscerated in retail markets, restaurants, or hotel kitchens, conditions are also conducive to contamination of other foods with feces and other wastes from the birds.

- Processing, particularly evisceration of carcasses, may be conducted at such high speeds that carcasses are frequently contaminated with feces or other filth.

These conditions, as well as others, may exist completely unknown to the ultimate consumer.

Conditions Inapparent to Consumer

Because of present marketing practices and buying habits, the average consumer has little personal knowledge concerning poultry and poultry products. This was not true years ago.

Formerly, the average family ate most of its meals in the home. The housewife selected her poultry live at the farm or market. Although not qualified to make a professional evaluation, she quickly refused any bird which did not appear to be bright and healthy. Similarly, upon

(except for overtime and holiday work) to be paid through appropriations to the Department of Agriculture.

2. Application of the act to the extent deemed desirable by the Secretary of Agriculture in certain areas of intrastate commerce, to be designated by him after hearings called at the request of certain State or local official agencies or industry groups.

3. Antemortem inspection of poultry to the extent deemed necessary by the Secretary of Agriculture.

4. Postmortem inspection of the carcass of each bird processed.

5. Condemnation of unwholesome or adulterated carcasses, parts, and products, and supervision over disposition of condemned material.

6. Approved labeling, including application of inspection legend, of all containers of product passed as wholesome and unadulterated.

7. Official supervision of all sanitation facilities and practices in plants under Department of Agriculture inspection; inspection to be withheld from plants not complying with such regulations as may be promulgated by the Secretary of Agriculture.

8. Movement of uneviscerated poultry carcasses (New York dressed poultry) outside the plant where slaughtered only as authorized by and under rules and regulations prescribed by the Secretary of Agriculture.

9. Prohibition of various actions which would circumvent the intent of the law; injunction proceedings and penalties for violations.

10. Maintenance of records for 2 years on the receipt, delivery, sale, movement, or disposition of poultry or poultry products in interstate or foreign commerce or in a designated area.

11. Exemptions for (a) producers who sell poultry directly to household consumers or restaurants, hotels, and boarding houses for use in their own dining rooms or in the preparation of meals for sale direct to consumers only, provided that such producers buy or sell no poultry products other than those produced from poultry raised on their own farms; (b) retail dealers who cut up ready-to-cook poultry for sale directly on the premises to retail consum-

ers; (c) other persons as deemed practicable until but not after July 1, 1960; and (d) persons processing poultry as required by recognized religious dietary laws, to the extent determined necessary by the Secretary of Agriculture to avoid conflict with such requirements while still effectuating the purposes of the act.

12. Regulation of imported slaughtered poultry or parts or products thereof.

13. Exemption of poultry and poultry products, insofar as regulated by the act, from the provisions of the Federal Food, Drug, and Cosmetic Act.

14. Cooperation by the Secretary of Agriculture with other branches of government and with State agencies in carrying out the provisions of the act.

15. Application of the act after January 1, 1958, to persons applying for Department of Agriculture inspection under the act and meeting all requirements; mandatory application of the act beginning January 1, 1959.

Problems Remain for States

After the new Federal law goes into effect, however, State and local agencies will still have major responsibilities for effective poultry hygiene programs.

1. The Department of Agriculture service will be provided only in processing plants; foodborne disease is often caused by mishandling of products during local distribution and in retail establishments.

2. Approximately 1,000 interstate processing plants will have Department of Agriculture service by 1960 under the new law, but there are about 2,500 intrastate plants. Some of the latter may be designated to come under the Federal law a few years from now, but the majority will remain a responsibility for State and local agencies and could become a dumping ground for diseased flocks, unless effective State and local programs are developed and maintained.

3. Certain exemptions are permitted under the Federal act which could result in the delivery of significant quantities of uninspected poultry directly to hotels, restaurants, and boarding houses. State and local ordinances

breaks occur among the employees of poultry processing plants.

10. Continuing research and field studies to delineate more definitely the health hazards associated with processing and consuming poultry and to develop increasingly effective safeguards.

Where Responsibility Rests

The concept of "let the buyer beware" cannot be applicable to foods. Recognizing his inability as an individual to make sure of the safety and acceptability of foods, the consumer looks to government for assurance and protection. While the food processor has a basic responsibility for his product, governmental agencies have found it necessary to provide various regulatory programs to guide and assist the food industries, and to protect against both unintentional and premeditated actions which may be detrimental to the health and welfare of the public.

In this country, State and local governments have primary responsibility for protecting the health and welfare of the citizens within their jurisdictions. Logically, this responsibility is usually assigned or delegated to the State and local health agencies. In turn, these agencies may seek, from Federal or other sources, specific assistance or guidance when research, field studies, or developmental work beyond the resources of one State or municipality is needed. The Public Health Service receives numerous requests of this nature.

On the other hand, a problem may be partly interstate in scope and can best be approached at the interstate level by the Federal Government. In either case, basic public health responsibility generally remains with the State and local health agencies. Because of the mass production and widespread distribution of many foods, this has been the pattern in food hygiene.

Thus, the Public Health Service provides technical assistance, develops program guides and training aids, conducts training courses, and engages in and supports research and investigations to aid States and municipalities in their milk and food programs. Upon the recommendation of both the Association of

State and Territorial Health Officers and the U. S. Livestock Sanitary Association, the Service developed a model ordinance covering sanitation in poultry processing and marketing (19-21).

The Food and Drug Administration inspects poultry processing plants engaged in interstate commerce and examines products shipped interstate. For almost 30 years the Department of Agriculture has provided voluntary inspection and sanitation services (22, 23) to poultry processors who apply and pay fees for it and who comply with regulations. This service seldom includes antemortem inspection and may cover only part of a particular plant's operations and products.

Official supervision over plants engaged only in intrastate commerce and over food products moving only intrastate, even though originating in federally inspected plants, has remained a function of the State and local governments. An estimated 50 percent of the Nation's processed poultry remains intrastate and is not subject to the Federal Food, Drug, and Cosmetic Act.

State and local governments have adopted varying laws and regulations concerning poultry hygiene (24). Some have not proved to be completely effective, either because they do not cover all major factors or because of a lack of uniformity in requirements, interpretation, or enforcement by jurisdictions in respective shipping and receiving areas. Virginia and Texas have recently initiated voluntary inspection-for-wholesomeness services to poultry processing plants. However, California is the only State which has a mandatory poultry inspection service, and actual inspection in California is conducted by licensed plant owners or employees.

Federal Legislation

In 1957 Congress enacted Public Law 85-172, the Poultry Products Inspection Act. Major items in this bill are:

1. Mandatory inspection by the Department of Agriculture of all poultry processed in plants engaged in interstate or foreign commerce, inspectors to be employees of the Department or designated State employees, and all expense

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Home Safety Activities

Increasing numbers of State and local health departments are recognizing that the prevention of accidents in the home is a matter for their concern.

This conclusion, reported by the National Health Council in their 1956 Home Safety Inventory, is based on a comparison with a survey undertaken by the American Public Health Association in 1955.

Only a very small percentage of the health departments consider their present programs adequate, but the wide variety of activities reported by different departments reveal a potential for extensive developments in the future.

Activities mentioned, in order of descending frequency, include assisting other groups in planning their programs, inservice training for their staffs, showing films, releasing news to the press, meetings, coordinating various programs within an area, exhibits, radio and television programs, workshops, institutes and conferences, demonstrations, research, inspections for hazards, surveys for injuries, and courses for baby sitters.

A most encouraging trend, the National Health Council said, is the extent to which local health departments are reaching directly into homes. Furthermore, almost all activities

are directed mainly to the family as a whole. Two-thirds of all health units reporting indicated that their activities were part of established long-range programs.

A healthy trend is evident, the council affirmed, in the degree to which health units are cooperating with other organizations, and in the emergence of the health department as a resource in home safety.

The Home Safety Inventory revealed several weaknesses in health department programs. Few were found to be directed specifically to preschool children and the aged, in whom accidents take their largest toll. Perhaps the greatest defect, the council said, is that most programs were determined by the program directors' felt needs or by a prescribed pattern rather than by the actual needs in the community.

The council's report concludes that "the need for positive leadership in home safety on the community and State level is a definite 'must.' Because of the health departments' awareness of the problem, the skill of their technical personnel, and their resources as an official agency, they are in a unique position to provide leadership and direction in preventing accidents in the home."

and regulations will be required to prevent such deliveries.

4. Irrespective of Federal inspection programs, State and local health departments have basic responsibility for investigating foodborne disease outbreaks attributed to poultry and poultry products and disease outbreaks among poultry plant employees, and for corrective and preventive measures.

5. Many of the public health problems associated with the processing, distribution, and consumption of poultry require research and related field investigations by health department personnel, who can plan and carry out studies correlating all essential factors.

Summary

Current methods of production and distribution of poultry and poultry products pose health and consumer problems which emphasize the need for effective, uniform poultry hygiene programs. These programs should include antemortem and postmortem inspection of poultry for wholesomeness, and supervision of sanitation in the processing and distribution of poultry and poultry products. Continuing research and field investigations will be needed to delineate health hazards associated with the processing and consumption of poultry, and to develop more effective health and consumer safeguards.

The Federal Government can provide substantial assistance to the States in poultry hygiene. The Public Health Service develops program guides and training aids, carries out and supports research and investigations, conducts training, and provides technical assistance with respect to State and local poultry sanitation. The Food and Drug Administration inspects processing plants which ship interstate, and poultry and poultry products in the channels of interstate commerce. The U. S. Department of Agriculture now provides a voluntary, industry-financed poultry inspection service; Congress has enacted a law to provide mandatory Department of Agriculture inspection in all poultry processing plants engaged in interstate commerce. But in the final analysis, State and local governments are confronted with a large part of the responsibility

for establishing and maintaining effective, uniform poultry hygiene programs.

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erally accepted as a more than satisfactory substitute for the heated toxin (10), and the intradermal skin reaction gives an index to the expected local and systemic reactions from a large dose of diphtheria toxoid.

A carefully measured 0.10 cc. of the dilute Schick toxin was injected intradermally in the left forearm, and the same amount of the control toxoid was injected into the right forearm after both surfaces had been prepared with alcohol.

For administrative reasons, the tests were read at 48 or 72 hours rather than at 96 or 120 hours as is commonly recommended when a control test is not used (11), and reactions were recorded in terms of actual measurement of the greatest diameter of induration at both the test and control sites. Test reactions of 10 mm. diameter or more, which were more than twice the size of the control reaction, were considered positive. To allay unnecessary anxiety, each child was given a printed interpretation of his particular reaction to the test, and the tester individually discussed the significance of each positive and allergic (control positive) reaction with the student.

While it is recognized that the use of dilute diphtheria toxin and toxoid for the testing actually gives subjects a small amount of immunizing antigen, sufficient to produce immunity in borderline susceptibles and probably cause a significant rise in antibody titer in immune subjects (12), it was not deemed feasible in this study to attempt to evaluate this effect.

To obtain comparable figures for older age groups, the test was also offered to, but not urged upon, the school faculty and lay personnel assisting with the testing. For each person tested the following information was obtained:

name, school, sex, race, birth date, and life-long residence in Montgomery County.

Information as to previous diphtheria immunization was not requested because of the large error in reporting to be expected from such a group as demonstrated by Geiger and associates in their San Francisco study of 1947-48 (13). It was further thought to be unnecessarily time consuming to seek such information from previous school medical records.

Schick Test Results

In the 9 schools with a total enrollment of 1,862 in the senior classes, 1,286 students were tested. Of these, 102, or 7.9 percent, had positive reactions (table 1). This figure is considerably lower than has been reported in similar age groups by other investigators (14-19). An additional 64, or 4.9 percent, had reactions of less than 10 mm., but the majority of these were of less than 4 mm. Since readings were taken at 48 or 72 hours, these probably represented local reaction to the trauma of injection rather than true mild reactions to the toxin, as there was an even greater number of similar minor reactions at the control site.

Of the 110 adults tested, 42, or 38 percent, were positive. This figure approximates those reported in naval recruits (20, 21), in soldiers (10, 22), and in medical students (14). All of these studies, however, dealt primarily with young adults. Sensitivity reactions were more frequent among the adults, as was to be expected, and the severity of such reactions was much greater (14, 16). In at least 3 instances in this study, adults with positive reactions still complained of pruritus and induration 2 months after the testing.

All students with positive Schick reactions

Table 1. Results of Schick tests, Montgomery County, Md., 1957

| Participants | Negative Schick and control | | Positive Schick | | Negative Schick, positive control | |
|---------------|-----------------------------|---------|-----------------|---------|-----------------------------------|---------|
| | Number | Percent | Number | Percent | Number | Percent |
| Students..... | 908 | 70. 6 | 102 | 7. 9 | 276 | 21. 5 |
| Adults..... | 49 | 44. 5 | 42 | 38. 2 | 19 | 17. 3 |
| Total..... | 957 | 68. 6 | 144 | 10. 3 | 295 | 21. 1 |

Diphtheria Immunity Status In Montgomery County School Seniors and Adults

JOHN B. ATWATER, M.D., and
WILLIAM J. PEEPLES, M.D., M.P.H.

DIPHtheria, once primarily a disease of infants and young children, has been increasing among adults and teen-aged children over the past 20 years (1-4). The shift in age-specific morbidity rates can be traced to markedly decreasing exposures to virulent *Corynebacterium diphtheriae*. The almost universal artificial immunization of infants and children has resulted in less frequent natural immunity among adults.

Somewhere between the adult and the child, however, lies a zone where the protection of unreinforced early immunization begins to wear off. Outbreaks of diphtheria in Detroit, Mich., Albuquerque, N. Mex., and South Carolina in the fall of 1956, while this study was still in the planning stages, pointed up the importance of continued awareness of the disease as a public health problem (5, 6). It also re-emphasized the value of current data on the relative immunity of various population segments in anticipating and preventing outbreaks.

In this study we undertook specifically to determine the relative immunity to diphtheria of the young adult population in an area where only 2 cases, both in white men in their early twenties, have been reported during the preceding 2 years. The study was conducted in Montgomery County, Md., during January and February 1957.

The county, principally a suburban residential center, is northwest of the District of Columbia and has an area of about 525 square miles. Its population, growing at a prodigious

rate in the postwar period with the influx of Government workers, is nearly 300,000. Of these, 6 percent are Negro. The county has the highest per capita income in Maryland.

Information gathered at the time of preschool conferences over the past 4 years reveals that about 92.5 percent of Montgomery County children have been actively immunized against diphtheria prior to registering for school, and the remainder are almost all given primary immunizations at this time (7). However, because of the large population influx, the inadequacy of transferred school health records, and basic doubt as to the duration of immunization in infancy and early childhood (8), the status of children finishing high school has been heretofore unknown. With the approval of the Montgomery County Medical Society and the superintendent of schools and the aid of the Maryland State Department of Health, the Montgomery County Health Department planned to give Schick tests to all 12th grade students in the county's nine high schools.

Procedure

Several weeks prior to the testing in the schools, each student was given a letter explaining the objectives of the testing program and the significance of the individual reactions, and requesting his parents' permission to give the Schick test. The response to the letter varied from 65 percent to 100 percent of the enrollment in different schools.

The actual testing and reading of the reactions was done by a single health department physician. The antigens used, obtained from the biologic laboratories of the Massachusetts Department of Public Health, consisted of diluted diphtheria toxin (0.02 MLD per 0.1 cc. dose) and purified diphtheria toxoid (0.008 Lf per 0.1 cc. dose) for use as the biological control.

Purified diphtheria toxoid was used in the control test to eliminate pseudoreactions caused by heated diphtheria toxin when used as a control. Possibly the heating process used in destroying the diphtheria toxin so alters the other proteins present that they are no longer capable of causing the reactions of the unheated material (9). The amount of toxoid used in each 0.1 cc. dose, though somewhat empirical, is gen-

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| Total..... | 957 | 68.6 | 144 | 10.3 | 295 | 21.1 |

Table 2. Schick reactors by sex and race, Montgomery County, Md., 1957

| Reactions | Students | | | | | | | | Adults | | | |
|---------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|
| | White | | Nonwhite | | Female | | Male | | Female | | Male | |
| | Num- ber | Per- cent | Num- ber | Per- cent | Num- ber | Per- cent | Num- ber | Per- cent | Num- ber | Per- cent | Num- ber | Per- cent |
| Positive..... | 96 | 7.8 | 6 | 9.8 | 46 | 7.0 | 56 | 8.9 | 23 | 40.3 | 19 | 35.8 |
| Negative..... | 1,129 | 92.2 | 55 | 90.2 | 611 | 93.0 | 573 | 91.1 | 34 | 59.7 | 34 | 64.2 |
| Total..... | 1,225 | 100 | 61 | 100 | 657 | 100 | 629 | 100 | 57 | 100 | 53 | 100 |

were referred to their private physician for immunization at his discretion. Because of increased sensitivity to diphtheria toxoid and the questioned significance of a single Schick test in an adult as an indication for toxoid administration (14), adults were cautioned about the possible consequences of requesting immunization and were advised to consult with their physician and to follow his advice. Approximately 2 months after completion of the testing program, a survey of all Schick positive students revealed that only 43 of 102 had contacted their doctors, and 27 of these had received immunizations. In addition, it is known that at least 7 of the adult group received toxoid.

Of 61 Negro students tested, 6, or 9.8 percent, had positive reactions. This is not significantly different from the 7.8 percent positive rate found in 1,225 white students. The reactor rate for all male students was 8.9 percent and for females 7.0 percent (table 2); however, this difference is of doubtful statistical significance.

In the adult group, the reverse was true; males 35.8 percent, females 40.3 percent. It is felt that the relatively increased immunity of the adult male over the female is due to the fact that the males tested were, in general, younger than the females.

Analyzing the reactor rates by age (table 3), a definite rise in the reactor rate with increasing age is evident. It must be recognized, however, that the spread of ages was heavily concentrated in 17- and 18-year olds, with 60 percent and 23 percent, respectively, of the total tested falling in these age groups.

The decreasing levels of immunity with increasing age, evident in this study, is the antithesis of that reported in school children in Baltimore in 1928 (17), and in New York in 1921 (23), when immunity to diphtheria was principally due to natural exposure to *C. diphtheriae* rather than having been artificially produced.

Because of the marked differences in socioeco-

Table 3. Percentage of positive Schick reactions by age and sex, Montgomery County, Md., 1957

| Age | Number tested | Number positive | Percent positive | Males positive | | Females positive | |
|------------------|---------------|-----------------|------------------|----------------|---------|------------------|---------|
| | | | | Number | Percent | Number | Percent |
| 16..... | 66 | 3 | 4.6 | 0 | 0 | 3 | 4.6 |
| 17..... | 838 | 69 | 8.2 | 38 | 4.5 | 31 | 3.7 |
| 18..... | 321 | 27 | 8.4 | 17 | 5.3 | 10 | 3.1 |
| 19..... | 38 | 3 | 7.9 | 2 | 5.3 | 1 | 2.6 |
| 20-29..... | 34 | 5 | 14.7 | 2 | 5.9 | 3 | 8.8 |
| 30-39..... | 38 | 12 | 31.8 | 8 | 21.0 | 4 | 10.5 |
| 40-49..... | 33 | 18 | 54.9 | 7 | 21.2 | 11 | 33.3 |
| 50 and over..... | 13 | 7 | 53.8 | 1 | 7.6 | 6 | 46.1 |
| Not listed..... | 15 | 0 | | | | | |
| All ages..... | 1,396 | 144 | 10.3 | 75 | 10.9 | 69 | 9.6 |

conomic factors between urban and rural sections of Montgomery County, a higher degree of immunity was anticipated for the urban area with its greater availability of medical supervision. Actually, however, the rate of immunity in the 3 largest schools serving the urban segment of the county is insignificantly lower than that in the remaining 6 schools in the more rural areas, which included the 1 all Negro school with the highest rate of any. On the other hand, the spread between the two largest schools with apparently similar population groups was from 6.2 percent to 9.2 percent positive reactors.

To the question, "Allowing for up to 6 months absence, have you always lived in Montgomery County?" 870 students (68 percent) and 100 adults (91 percent) answered negatively. There was no significant difference between the answers of the Schick reactors (students, 65 percent; adults, 90 percent) and the nonreactors (students, 68 percent; adults, 91 percent). This indicates that the marked immigration into the county has not introduced a new susceptible group into a relatively immune population, as has been demonstrated before some epidemics (23).

Conclusions

The principal conclusion to be drawn from the data is that regardless of whatever minor differences in immunity levels among the students might occur on the basis of age, sex, race, length of residence, or rural-urban location, the Schick reactor rate in Montgomery County high school seniors is low. It compares quite favorably with the 23 percent reported in San Francisco (13), and 17 percent in York, Pa. (8).

The senior high school population, therefore, is quite well protected against diphtheria and the occurrence of more than sporadic cases is unlikely. The adults in the school population, on the other hand, are significantly less immune. In addition to the annual evaluation of immunization among preschool children, it might be well to sample regularly, at perhaps 5-year intervals, the diphtheria immunity of the teen-aged groups and young and middle-aged adults.

Such periodic evaluation may well evidence that since infant and preschool immunization

in this particular community is accepted practice, the facilities and efforts of the health department and medical profession should be directed toward maintaining high levels of immunity in the adult population.

In considering this possibility we must remain aware of the high levels of sensitivity to diphtheria toxoid. Edsall and associates report on the use of minute amounts (1 to 2 Lf) of highly purified diphtheria toxoid in combination with tetanus toxoid (25). Such combination has been used by the Armed Forces for approximately 3 years and has recently become commercially available as "tetanus-diphtheria toxoid, for adult use."

It is probable that because of the low incidence of cases of diphtheria and, therefore a decreased incidence of carriers of virulent diphtheria organisms, active, natural immunization is not occurring with any great frequency. The high degree of immunity demonstrated probably represents a carryover of significant protection from preschool immunizations. Immunization in the adult population, however, when performed was done with antigens, presumably less effective than those now available, and the lack of reinforcing exposures to the organism may be of greater importance.

Summary

In January and February 1957, 1,286 Montgomery County, Md., 12th graders and 110 adults were given Schick tests with control tests. The Schick positive rate for the students was 7.9 percent and for the adults, 38 percent. No statistically significant correlation was found for race, sex, or residence.

The results suggest the need for periodic sampling of diphtheria immunity among teen-aged and adult segments of the population.

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London Seminar in Health Education

An international seminar on the principles, methods, and media of health education was held in London, England, April 22-25, 1958, under the sponsorship of the Central Council of Health Education.

The program covered the philosophy and practice of health education through theoretical lectures, group discussions, and practical demonstration of techniques. Scheduled subjects were planning the program, choosing the methods, selecting the means, use of equipment, and mass media in health education.

Comparison of CF and HI Tests on Psittacosis-LGV Serums

MATTHEW A. BUCCA, Ph.D.

WITHIN recent years, public health laboratories have received an unprecedented number of requests for the laboratory diagnosis of specimens from patients with suspect infections incriminating members of the psittacosis-lymphogranuloma venereum (LGV) group of viruses. Since most of the laboratories are not equipped to prepare their own psittacosis antigens for the performance of complement fixation (CF) tests, it has been necessary to rely upon commercially available sources for their supply. It has also been the practice, and at times the necessity, to substitute LGV for psittacosis CF antigens in tests on serums from cases of psittacosis on the basis that one is dealing with a group-specific antigen-antibody reaction. Meyer (1) stated that half of his serums positive by psittacosis CF test exhibited no reaction with lygranum antigen dosages indicated on the label. Volkert and Christensen (2), however, concluded from their data that both antigens in two unit dosages may be utilized for routine testing. The present study represents a comparison of three tests using psittacosis and LGV antigens on individual human serums.

Methods

The psittacosis antigen (3) consisted of heavily infected allantoic fluids which were phenolized and subsequently lyophilized after

concentration to one-fifth the original volume. Control antigen was prepared in the identical manner using normal embryonated eggs of the same age and batch.

Lygranum CF antigen was purchased from commercial sources, and the control antigen was the one accompanying the viral antigen.

The CF test for this study was that described by Sigel and co-workers (4). Both psittacosis and lygranum CF antigens were titrated by the block technique with ornithosis positive serum and two units used in the respective tests. Complement was added to the antigen-antibody system in a dosage of 1.8 to 2.0 units. All test serums were preliminarily absorbed with packed sheep erythrocytes and then inactivated at 56° C. for a period of 30 minutes before testing.

The psittacosis hemagglutinating antigen was also prepared from infected embryonated eggs. The infected allantoic fluid was centrifuged at 5,000 × gravity for 1 hour and the supernatant fluid, which served as the hemagglutinin, was stored at temperatures below -30° C. The hemagglutination-inhibition (HI) test was performed according to the method of Hilleman and co-workers (5, 6). All serums for this test were first absorbed with murine erythrocytes and then inactivated at 56° C. for 30 minutes.

Results

One hundred and six "negative" serums were selected to ascertain the baseline reaction of the HI test. Selections were based on a series of preliminary tests performed on serums received in the laboratory showing negative CF reactions in dilutions of 1:2 when tested with psittacosis

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Table 1. Nonspecific inhibition of serums by psittacosis HI test

| Serum dilution | Number | Percent |
|----------------|--------|---------|
| <1:16 | 30 | 28.3 |
| 1:16 | 64 | 60.3 |
| 1:32 | 12 | 11.5 |
| 1:64 | 0 | 0 |

and lygranum CF antigens. These serums were also found to be negative by CF tests for certain members of the neurotropic group of viruses routinely tested in the diagnostic laboratory.

It may be seen from table 1 that nonspecific inhibition may occur in this test in serum dilutions through 1:32. Most of the hemagglutinin inhibitions appeared in serum dilutions of 1:16. A serum dilution of 1:64 must, therefore, be used for the baseline reactivity to avoid nonspecificity.

A total of 103 positive serums were tested for the comparative test series. Most of these

serums (87 percent) were taken from patients presenting a clinical history of, or exposure to, members of the psittacosis-LGV group of viruses (ornithosis and lymphogranuloma venereum). The results of the three serologic tests performed on the same serums are shown in tables 2, 3, and 4.

It is apparent from table 2 that psittacosis CF antigen was able to detect a larger number of positive serums than lygranum CF antigen. Ten of the serums (9.7 percent) showed some positive titer with psittacosis CF antigen when lygranum CF antigen was unable to react at the lowest dilution of serum tested (1:2). Thirty-six (34.9 percent) of the serums elicited the same titer when tested with both CF antigens. Higher titers with psittacosis CF antigen were obtained with 61.2 percent of the serums as compared with lygranum CF antigen tested on the same serums, whereas only 3.9 percent of the serums gave higher titers with lygranum antigen.

Table 2. Number of serums reacting to psittacosis and lygranum CF tests

Psittacosis CF Titers

| Lygranum CF Titers | | | | | | | | | | | |
|--------------------|------|-----|-----|-----|------|------|------|-------|-------|-------|-------|
| Serum dilution | <1:2 | 1:2 | 1:4 | 1:8 | 1:16 | 1:32 | 1:64 | 1:128 | 1:256 | 1:512 | Total |
| 1:2----- | 4 | 9 | 1 | | | | | | | | 14 |
| 1:4----- | 3 | 12 | 8 | 2 | | | | | | | 25 |
| 1:8----- | | 3 | 10 | 6 | | | | | | | 19 |
| 1:16----- | 1 | | | 10 | 8 | | | | | | 19 |
| 1:32----- | 1 | 1 | | 2 | 7 | 4 | | | | | 15 |
| 1:64----- | 1 | | | | 2 | 6 | | | | | 9 |
| 1:128----- | | | | | | | | 1 | | | 1 |
| 1:256----- | | | | | | | | | | 1 | 1 |
| Total----- | 10 | 25 | 19 | 20 | 17 | 10 | 0 | 1 | 0 | 1 | 103 |

Table 3. Number of serums reacting to psittacosis CF and psittacosis HI tests

| Psittacosis CF Titers | Psittacosis HI Titers | | | | | | | | Total |
|-----------------------|-----------------------|-------|------|------|------|-------|-------|-------|-------|
| | Serum dilution | <1:16 | 1:16 | 1:32 | 1:64 | 1:128 | 1:256 | 1:512 | |
| | 1:2 | 1 | 10 | 3 | | | | | 14 |
| | 1:4 | 1 | 11 | 5 | 6 | 2 | | | 25 |
| | 1:8 | | 5 | 4 | 5 | 3 | 2 | | 19 |
| | 1:16 | | | 2 | 3 | 10 | 4 | | 19 |
| | 1:32 | | | 1 | 5 | 6 | 1 | 2 | 15 |
| | 1:64 | | | | 1 | 2 | 4 | 1 | 9 |
| | 1:128 | | | | | | | 1 | 1 |
| | 1:256 | | | | | | | | 1 |
| | Total | 2 | 26 | 15 | 20 | 23 | 11 | 4 | 103 |

Table 4. Number of serums reacting to psittacosis HI and lygranum CF tests

Psittacosis HI Titers

| Lygranum CF Titers | Serum dilution | <1:16 | 1:16 | 1:32 | 1:64 | 1:128 | 1:256 | 1:512 | 1:1,024 | Total |
|--------------------|----------------|-------|------|------|------|-------|-------|-------|---------|-------|
| | <1:2 | | 3 | 2 | 1 | 2 | 1 | 1 | | 10 |
| | 1:2 | 2 | 14 | 6 | 2 | | 1 | | | 25 |
| | 1:4 | | 7 | 4 | 4 | 3 | 1 | | | 19 |
| | 1:8 | | 2 | 1 | 7 | 8 | 2 | | | 20 |
| | 1:16 | | | 2 | 5 | 6 | 3 | 1 | | 17 |
| | 1:32 | | | | 1 | 4 | 3 | 1 | 1 | 10 |
| | 1:64 | | | | | | | | 1 | 0 |
| | 1:128 | | | | | | | | 1 | 1 |
| | 1:256 | | | | | | | | | 0 |
| | 1:512 | | | | | | | 1 | | 1 |
| Total | | 2 | 26 | 15 | 20 | 23 | 11 | 4 | 2 | 103 |

From tables 3 and 4 one observes that an equal number of serums (60) showed positive HI titers (considering the baseline titer of the HI test to be 1:64 or higher) from both the psittacosis CF and lygranum CF groups. Five of the serums (4.9 percent) exhibiting no reaction with lygranum CF antigen in dilutions of 1:2 or higher elicited HI titers of 1:64 through 1:512. More serums (33 percent) tested with lygranum CF antigen in low dilutions (up through 1:8 dilution of serum) gave positive HI titers than serums tested with psittacosis CF antigen (18 percent) in the same dilution range. Of the 93 serums which were positive by both psittacosis CF and lygranum CF tests, only 55 (or 59.1 percent) were positive to the psittacosis HI test.

Discussion

The results presented above indicate that a nonspecific reaction may be obtained in the psittacosis HI test in serum dilutions through 1:32. At a serum dilution of 1:32, 11.5 percent of the 106 serums tested showed this type of reaction. Hilleman and co-workers (5) have indicated from a smaller group study that human serum titers of less than 1:40 are not considered significant when tested with meningopneumonitis hemagglutinating antigen. Studies conducted by Ephrati-Elizur and Bernkopf (7) show that 6 percent of their apparently normal serums reacted nonspecifically in dilutions of 1:40 and 2 percent in dilutions of 1:80. They, therefore, considered HI titers above 1:80 as falling outside of the normal

range of nonspecificity. It should, however, be pointed out that this unfavorable property of the HI test may not necessarily invalidate the application of this test to diagnostic procedures. The serologic criterion of an infection is generally taken as a fourfold or higher increase in titer of the convalescent phase serum over the acute phase specimen. Although individual serums elicit considerable variations in the nonspecific property, the demonstration of a rise in HI antibody with paired serums may provide significant diagnostic information.

Meyer and Eddie (8) state that LGV antigens from any source are unsatisfactory for the serodiagnosis of psittacosis infections and that only psittacosis antigens should be utilized in the CF test. A large number of our reactive serums were derived from patients with clinical histories indicating infections of the psittacosis-LGV group or presenting a history of exposure to birds. Our results verify the fact that the psittacosis antigen generally exhibits a higher sensitivity than the lygranum antigen in serums with positive psittacosis CF tests.

Summary and Conclusion

Three tests were compared for the detection of antibodies to the psittacosis-LGV group of viruses.

The psittacosis HI test exhibits nonspecific reactions in serum dilutions through 1:32. This places a limitation on its practical application except where a significant antibody rise in paired serums can be demonstrated.

Only 59 percent of the serums positive by both psittacosis CF and lygranum CF tests were also positive by the psittacosis HI test.

With the current techniques employed, the psittacosis CF antigen reacts with a larger number of serums and in general gives higher titers than the lygranum CF antigen.

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Local Health Departments and Rehabilitation

Local health departments with trained and experienced staff would be immensely helpful in all areas of service to the handicapped, according to the conclusions of a 1956-57 study of rehabilitation services for the deaf and hard of hearing in Metropolitan Boston. The study was conducted by the Rehabilitation Council, United Community Services of Metropolitan Boston.

Lack of adequate local public health services is basic to many of the problems of availability and use of rehabilitation services, the council concluded. They mentioned these problems in particular: hearing testing in parochial schools, followup of screening test failures, development of ancillary services in suburban and rural areas, and adequate speech reading and auditory training facilities in public schools.

Many of the findings of their study, the council pointed out, are applicable to all the handicapped.

Variation in Three Staphylococcal Typing Phages

JOHN E. BLAIR, Ph.D.,
and E. T. BYNOE, Ph.D.

A standard set of staphylococcal typing phages is now used in practically all laboratories where a staphylococcal typing service has been established. Comparison of the phage patterns encountered in different laboratories is valid only to the extent that the phages used in those laboratories have remained stable and have retained their original patterns of lytic activity. This is especially important when one attempts to determine the geographic distribution of strains of *Staphylococcus aureus* showing a specific phage pattern. It is conceivable that although the same strain might be encountered in several different laboratories, it would not be regarded by some laboratories as being identical if variation had affected the lytic patterns of the phages concerned.

That variation in patterns of lytic activity may occur was demonstrated by Wahl (1), who noted that from phage 44A, which has a rather limited lytic spectrum, a mutant phage developed which exhibited a wide range of activity. The mutant was designated as "phage 68."

We have obtained evidence which suggests that variation in lytic activity has taken place in certain staphylococcal typing phages that are currently being used in the United States. The phages involved are those designated as "52," "42B," and "44A."

Dr. Blair is head of the division of bacteriology, laboratories division, Hospital for Joint Diseases, New York City, and Dr. Bynoe is chief of the bacteriology laboratories, laboratory of hygiene, Department of Health and Welfare, Ottawa, Canada. They represent the United States and Canada on the International Committee on Staphylococcus Phage Typing, and their laboratories are the central reference laboratories for staphylococcal phage typing in their respective countries.

Phage 44A appears to have undergone variation in the direction of a wide host range, in a manner comparable to that observed by Wahl. It often occurs in the phage pattern of strains of staphylococci in any of the broad phage groups, and thus appears to be of little differential value.

Soon after the report by Bynoe, Elder, and Comtois (2) of the existence of a strain of *S. aureus* which was susceptible only to the recently described phage 81, it was found that apparently similar strains isolated in the United States were lysed by phages 52 and 42B as well as by phage 81. We suspected that this could probably be attributed to the fact that the phages 52 and 42B employed in laboratories in the United States had undergone some variation in lytic activity in the direction of a slightly wider host range. In most instances these phages had been supplied by Dr. Blair.

To determine whether variation in lytic activity had occurred, we examined a number of strains of *S. aureus*, isolated both in Canada and the United States, which were known to be susceptible to phage 81. The stock phages and propagating strains of our laboratories were exchanged and the following preparations were made in each laboratory: Laboratory of Hygiene ("LH") phages were propagated on LH strains of *S. aureus*; LH phages were prepared on Hospital for Joint Diseases (HJD) strains; HJD phages were propagated on LH strains; and HJD phages were prepared on HJD strains. The cultures to be examined were then typed in the usual manner with each of the four phage preparations.

The results obtained in both laboratories showed essentially mutual confirmation. Canadian strains of *S. aureus* that had been lysed only by the LH stock phage 81 showed only the pattern 81 when typed with LH phages prepared on either LH or HJD propagating strains. When typed with HJD phages prepared on either LH or HJD propagating strains, they showed the pattern 52/42B/81. Strains isolated in the United States that had originally shown the pattern 52/42B/81 with the HJD stock phages were lysed only by phage 81 when typed with LH phages prepared on either LH or HJD propagating strains. When typed with HJD phages prepared on LH or

HJD propagating strains, these strains showed the pattern 52/42B/81.

It seems clear that phages 52 and 42B, as maintained in the laboratory of the Hospital for Joint Diseases, had undergone variation to the extent that they were able to lyse cultures of "type" 81. Variation apparently has not gone beyond this point, for both phage 52 and phage 42B have appeared only in other patterns in which they might normally be expected to occur.

The cultures, stock phages, and propagating strains from both laboratories were submitted to Dr. R. E. O. Williams in the Central Reference Laboratory in London, who examined them in a manner similar to that described above and in a personal communication reported confirmation of our results.

Bynoe and his associates have reported that phage 80, which was developed in Australia by Rountree and Freeman (3), appears to be closely similar to phage 81, and that cultures of *S. aureus* which are susceptible to phage 81, are nearly always lysed also by phage 80 (2). This has been the experience in the laboratory of the Hospital for Joint Diseases.

There would appear to be little question that the strains of *S. aureus* which now are being widely encountered in Canada and the United States and which have been reported, respectively, to show the patterns 81 or 52/42B/81

are identical. In the interest of uniformity of reporting and to remove any confusion that might exist in the minds of the readers of the literature as to the identity of these strains, the authors propose that such strains now be designated as 80/81, the designation given them by the International Typing Reference Center at the Central Reference Laboratory.

To insure results that are more nearly comparable to those obtained at the Central Reference Laboratory, Dr. Blair has obtained from Dr. Williams new specific lots of phages 52, 42B, and 44A, which he plans to include in sets of phages for future distribution and to send to those laboratories in the United States where a phage typing service is now in operation.

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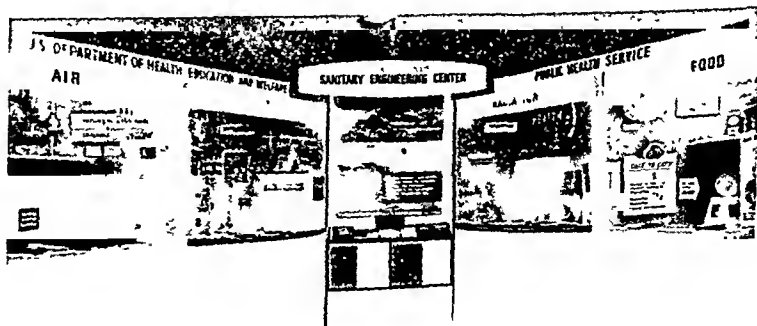
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PHS Exhibit

Sanitary Engineering Center Program

An exhibit of the Robert A. Taft Sanitary Engineering Center of the Public Health Service shows major programs of environmental research. The central panel is flanked by four others, for air, water, radiation, and food, respectively.

The displays include animated and still graphics, models, samples, literature, and some equipment in operation.



Specifications: Floor space 20' by 8'. (Can be used with different arrangements of the five units.) Operates from one or two 110-volt a. c. outlets. Shipping weight, 1,200 lbs. The setting-up requires two men. Available by special arrangement only with the Director, Robert A. Taft Sanitary Engineering Center, Public Health Service, Cincinnati 26, Ohio.

Poverty, Pica, and Poisoning

J. EDMUND BRADLEY, M.D., and SAMUEL P. BESSMAN, M.D.

A RECENT study of 333 children living in an old, congested, low-income area of Baltimore, Md., showed that 44.4 percent of these children had abnormal blood lead values of 0.05 mg. percent and higher (1). The children were selected at random from those brought to the pediatric clinics of the University of Maryland Hospital for health supervision or for complaints other than those usually associated with lead poisoning.

Since the history of pica (eating of nonfood material) was found in 69.6 percent of the children, the source of lead apparently was paint chewed from surfaces of wood or plaster or particles of paint swallowed after it had flaked from the surfaces.

Samples of paint were collected from typical homes and the lead content determined. The lead content in each sample was in excess of the recommended 1 percent of the total weight of the contained solids (2).

The majority of the children apparently swallowed paint from indoor surfaces. However, others may have eaten paint which had peeled from exterior walls. The interior of the home of one child with lead poisoning did not have toxic amounts of lead on its painted surfaces, but it was learned that the child sat on the stoop outside and ate particles of paint fallen from the exterior walls. These contained toxic amounts of lead.

Dr. Bradley is professor and head of pediatrics, and Dr. Bessman is associate professor of pediatrics, University of Maryland School of Medicine. A grant-in-aid from the Department of Health, Education, and Welfare supported the study described in this article.

Pica as the source of lead was also supported by the lack of abnormal blood lead values in infants under 10 months of age. However, the increased incidence of abnormal values beginning at 10 months of age continued through the third year of life and then declined. This age distribution corresponds to the period when the child is confined to the home, has greater need for oral gratification, and in crowded situations has fewer controlled interest opportunities. Further support for pica as the source of lead intoxication is found in current studies by Dr. J. E. Bradley and R. S. Mosser of blood lead values of children in different socioeconomic strata. The data obtained suggest that the mean values of the lower group will exceed many fold the mean values of the middle and upper groups.

Contributing factors to this high incidence of lead intoxication seems to be related directly to environment. First, these children live in houses where lead-containing paint, used many years ago, is now flaking and peeling from the surface. Second, there seems to be widespread ignorance or disregard of the hazards to the child through the ingestion of these particles. Despite vigorous education campaigns which have been conducted by the public health department in Baltimore, many parents continue to accept pica as a harmless manifestation of normal infantile development. Third, crowded conditions within the home, and in many instances the absence of supervision by adults who may be obliged to leave the children to earn a living, allow the infant and preschool child opportunity to eat toxic material without restraint.

The main hazard of lead poisoning in a child

is lead encephalopathy. The frequency of lead encephalopathy is unknown, since only a few communities require reports of these cases. The incidence is suggested from the report that 538 Baltimore children were admitted to Baltimore hospitals with lead encephalopathy from January 1, 1931, to January 1, 1956 (3). Lead encephalopathy, despite recent advances in treatment, continues to result in neurological sequelae, mental retardation, or death (4,5).

The observations in the Baltimore study suggest that there is a high incidence of lead poisoning in other metropolitan areas where slums exist and where paint contains lead. The study also suggests that physicians need to be constantly aware and alert to the symptoms of lead poisoning in children.

Since this disease is essentially environmental, preventive measures are possible. This will require the cooperative effort of physicians, nurses, and social workers of municipal health and welfare departments who will warn par-

ents constantly of the seriousness of pica in children.

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Legal Criteria for Evidence of Intoxication

A bill setting forth the legal significance of findings from alcoholic intoxication tests of drivers on trial in the District of Columbia became law March 4, 1958. The legislation eliminates a previous need for expert witnesses to explain the legal ramifications of test results.

If the defendant's blood has 0.15 percent or more alcohol by weight, or an equivalent proportion of alcohol in 2,000 cubic centimeters of his breath, he is presumed to be intoxicated. Alcohol equaling 0.20 percent by weight in the urine has the same legal significance.

Percentages of 0.05 or less in the blood or breath and 0.08 or less in the urine are proof of sobriety; and alcohol levels between 0.05 and 0.15 in the blood and breath and between 0.08 and 0.20 in the urine constitute relevant evidence but neither proof nor disproof of sobriety or intoxication.

Drivers are not obligated to submit to the tests, the results of which apply when they are tried for driving while intoxicated, for negligent homicide, or for manslaughter.

Only a physician acting at the request of a police officer may withdraw a blood sample for testing. The defendant may request that his own physician conduct additional chemical tests. Results are available to the tested person on request.

Rat, Flea, and Murine Typhus Recurrence Following Eradication Measures

WILLIAM W. SMITH, Ph.D.

AN EXPERIMENTAL attempt to eradicate murine typhus was made in the rural southeastern quarter of Grady County, Ga., between July 3, 1953, and May 4, 1954. The experiment was considered a success and has been reported by Mohr and Smith (1).

The chief eradication measures used were intensive poisoning of commensal roof and Norway rats, *Rattus rattus* (Linnaeus) and *Rattus norvegicus* (Erxleben), and applying 10 percent DDT dust in rat runs to reduce the numbers of oriental rat fleas, *Xenopsylla cheopis* (Rothschild). Though lack of time for extensive studies and application of special treatments made it impossible to eliminate rats completely at about 5 percent of the farms in the experimental area, it was believed that eradication of murine typhus would not require complete elimination of rats and oriental rat fleas.

For 3 years after the eradication program, the experimental area was inspected periodically to determine the rates at which commensal rats, rat fleas, and murine typhus reestablish themselves. The results of these inspections are reported here.

Methods and Procedure

During the period July 13 to August 5, 1954, a preliminary inspection was made of 306 premises closest to the 5.5 percent from which it had not been possible to eradicate all rats. More extensive inspections were made annually during the months of March through May in 1955, 1956, and 1957. It was not possible each

year to inspect every one of the premises originally inspected and grouped according to infestation status under the eradication program. Each annual inspection, however, covered a representative number of premises in each of the three groups that had been set up under the eradication program (table 1).

The farm premises were examined for signs of rats such as fresh droppings, burrows, trails, and gnawing. Occupants were questioned as to whether or not rats were present. If there was doubt as to the existence of an infestation, dust patches were used and the premises were reinspected until a definite decision could be reached.

Unbaited No. 0 steel traps were set in runs wherever it appeared that rats might be caught. Rats obtained alive were brought to the laboratory where they were identified, sexed, killed by bleeding from the heart, and brushed and searched for ectoparasites. Blood serums from these rats were sent to the Communicable Disease Center Virus and Rickettsia Disease Laboratory in Montgomery, Ala., where they were tested by complement fixation for the presence of murine typhus antibodies. Rats found dead in the traps were identified and recorded, but they are excluded from discussion and data presented in this paper.

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Although eradication measures were employed until May 4, 1954, many premises had been cleared of rats before that date. For purposes of discussion, the 1955, 1956, and 1957 inspections are considered to have been completed, respectively, 1, 2, and 3 years after the eradication program ended.

Rat Reinfestations

The preliminary inspections made in the summer of 1954 showed that 16 (5.2 percent) of the premises nearest the farms at which it had not been possible to eliminate rats had become infested again. Practically all of the 306 premises inspected at that time were within three-fourths of a mile of such farms.

The results of the last three annual inspections are shown in table 1. Of the premises

Table 1. Commensal rat infestation of experimental area, Grady County, Ga., 1, 2, and 3 years after eradication program ending May 4, 1954

| Infestation status on May 4, 1954, and subsequent changes | 1955 | 1956 | 1957 |
|--|------|------|------|
| <i>Premises cleared of rats by eradication¹</i> | | | |
| Number inspected..... | 221 | 221 | 198 |
| Percent: | | | |
| Still clear..... | 70.6 | 67.0 | 58.3 |
| Infested..... | 25.4 | 17.2 | 29.9 |
| Had become infested, but clear at annual inspection.. | 4.0 | 15.8 | 11.8 |
| <i>Premises uninfested at time of eradication²</i> | | | |
| Number inspected..... | 282 | 282 | 266 |
| Percent: | | | |
| Still clear..... | 91.5 | 89.4 | 85.5 |
| Infested..... | 6.7 | 3.5 | 6.7 |
| Had become infested, but clear at annual inspection.. | 1.8 | 7.1 | 7.8 |
| <i>Premises not cleared of rats by eradication³</i> | | | |
| Number inspected..... | 29 | 29 | 29 |
| Percent: | | | |
| Still infested..... | 44.8 | 24.1 | 21.4 |
| Clear..... | 55.2 | 72.4 | 46.4 |
| Had been clear, but reinfested at annual inspection..... | 0 | 3.5 | 32.2 |

¹ 232 premises.

² 297 premises.

³ 31 premises.

Table 2. Incidence of typhus antibodies among commensal rats trapped in eradication area, Grady County, Ga., 1954-57

| | 1954 | 1955 | 1956 | 1957 |
|--|------|------|------|------|
| Number of farms where rats were trapped..... | 28 | 57 | 41 | 66 |
| Number of rats: | | | | |
| Trapped and examined.. | 70 | 139 | 142 | 148 |
| With typhus antibodies..... | 3 | 1 | 4 | 0 |
| Percent of rats with typhus antibodies..... | 4.3 | 0.7 | 2.9 | 0.0 |

cleared of rats under the eradication program and inspected each year, 70.6 percent remained uninfested at the end of the first year (1955), 67 percent at the end of the second year, and 58.3 percent at the end of the third year. In 1955, 25.4 percent of the premises inspected again had rats, and another 4 percent had become infested but were clear of rats at this inspection. In 1956, 17.2 percent of the premises inspected were reinfested, while 15.8 percent had had rat infestations since the end of the eradication program but were uninfested at the time of inspection. Inspection in 1957 showed 29.9 percent reinfested, and another 11.8 percent which had been reinfested since 1954 but were clear at this inspection.

Premises uninfested at the time of eradication changed little from year to year, as shown by the high proportion of these premises which remained clear over the 3-year period—91.5 percent of those inspected in 1955, 89.4 percent in 1956, and 85.5 percent in 1957 (table 1).

The greatest changes of infestation status occurred in the small group of infested premises which had not been cleared of rats by eradication efforts. In 1955, 55.2 percent of the premises inspected in this group were uninfested at the time of inspection. By 1956, the percentage of premises inspected that had been clear of rats at some time since 1954 had changed to 75.9, and by 1957, to 78.6.

Typhus Antibodies in Rats

Tests of serums from 70 rats trapped immediately after eradication at 28 uncleared prem-

ises showed that 3 rats had typhus antibodies (table 2). These 3 rats came from 2 premises well within the study area. At the end of the first year after eradication, only 1 rat with typhus antibodies was found among the 139 rats trapped from 57 premises. This rat was taken from a farm at the edge of the eradication zone and was believed to have moved in from the adjacent untreated region. At the end of the second year, 4 of 142 rats taken from 41 farms showed typhus antibodies. These 4 rats came from 2 farms, one of which was near the border and the other well within the eradication area. At the end of the third year, none of the 148 rats trapped from 66 farms revealed any typhus antibodies.

Ectoparasite Abundance

Data on ectoparasite infestations of the rats examined from 1954 through 1957 are shown in table 3. In 1955, 1956, and 1957, the percentages of rats examined which were infested with *X. cheopis* were 0.0, 8.5, and 4.1, respectively. *X. cheopis* indexes (average per rat examined) were 0.0, 0.2, and 0.4 for those years. In the same years, the sticktite flea (*Echidnophaga gallinacea*) was the most abundant flea species, with averages of 6, 7.4, and 3.9 per rat examined. The most common mite was *Bdellonyssus bacoti* with annual averages per rat of 7.8, 1.1, and 2.3. The spined rat louse (*Polyplax spinulosa*) was found on 57.5, 62, and 83.2 percent of the rats examined in these years; its annual indexes were 7.2, 6.8, and 9.9, respectively.

Discussion

Two to three months after typhus eradication measures were terminated, about 5 percent of the farm premises which had been cleared of rats during the operational period had become reinfested. All were within 1 mile of rat-infested farms. This relatively high rate of reinfestation, including those premises that had become infested but were clear at annual inspection, increased to 29.4 percent, 33 percent, and 41.7 percent of premises inspected in 1955, 1956, and 1957, respectively (table 1). The reinfestation rate was undoubtedly influenced greatly by the proximity of premises susceptible to rat

Table 3. Ectoparasite infestation of commensal rats in eradication area of Grady County, Ga., 1954-57

| Year and ectoparasite species | Ectoparasite concentration | | |
|------------------------------------|---------------------------------------|--------------------------|--------------------------|
| | Average per rat examined ¹ | Percent of rats infested | Average per rat infested |
| 1954 | | | |
| <i>Xenopsylla cheopis</i> | 0.0 | 0.0 | 0.0 |
| <i>Echidnophaga gallinacea</i> ... | 3.1 | 35.3 | 8.8 |
| <i>Bdellonyssus bacoti</i> | .2 | 2.9 | 2.7 |
| <i>Polyplax spinulosa</i> | 1.5 | 17.6 | 6.9 |
| 1955 | | | |
| <i>Xenopsylla cheopis</i> | 0 | 0 | 0 |
| <i>Echidnophaga gallinacea</i> ... | 6.0 | 26.6 | 22.7 |
| <i>Bdellonyssus bacoti</i> | 7.8 | 19.4 | 40.5 |
| <i>Polyplax spinulosa</i> | 7.2 | 57.5 | 12.5 |
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¹ Numbers of rats examined for ectoparasites in the years 1954-57 were 34, 139, 142, and 148, respectively, and are identical with numbers of rats trapped each year except for 1954, when 70 rats were trapped (table 2).

infestation to those where some rats remained. Emlen and others (2) found that populations of Norway rats in urban situations recovered at the rate of 2 to 6 percent per month when reduced to as low as 10 percent of their original level.

Reinfestation of cleared premises, again including those that had become infested but were clear at annual inspection, increased very little (by 3.6 percent of premises inspected) between the 1955 and 1956 inspections. Possibly the increase in reinfestation was small in the second year because the emigrant rats were reestablishing colonies in the new situations and had not increased in numbers sufficiently to supply impetus for further extensive emigrations. In the third year, however, reinfestation increased by 8.7 percent (table 1). Emlen and his co-work-

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Discussion

Two to three months after typhus eradication measures were terminated, about 5 percent of the farm premises which had been cleared of rats during the operational period had become reinfested. All were within 1 mile of rat-infested farms. This relatively high rate of reinfestation, including those premises that had become infested but were clear at annual inspection, increased to 29.4 percent, 33 percent, and 41.7 percent of premises inspected in 1955, 1956, and 1957, respectively (table 1). The reinfestation rate was undoubtedly influenced greatly by the proximity of premises susceptible to rat

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ers (2) noted in their study that 2 years elapsed before reinfestation occurred in one location where all Norway rats had been destroyed.

Since only one survey of the study area could be made each year, progressive emigrations and reinfestations could be determined only in a general manner. Few premises which were reinfested during the first year were as far as a mile from one of the premises not entirely cleared of rats. The manner and causes of rat migration to new premises were not determined, but in addition to the ecological factors, such as dwindling food supplies and harborage removal, commonly believed to motivate emigrations, inherent wandering tendencies—particularly in roof rats—appear to be influential.

Rural premises which are uninfested by commensal rats are generally incapable of supporting or harboring these rodents. If the farm is a poor one, little or no foodstuff is likely to be available to rats, and the usual small, openly constructed buildings do not afford suitable harborage. Another deterrent is activity constant enough to disturb rats attempting to settle. In the eradication area, rat control measures on farms were rarely extensive enough to prevent reinfestation. In a few cases, however, the intensive efforts of individual farmers apparently accounted for complete freedom from commensal rats, at least for short periods. For these varying reasons, uninfested premises tended to remain uninfested (table 1).

Farms at which rat eradication was impossible were least stable with relation to changes in rat infestation. At the end of each of the 3 years after eradication measures ceased, 55.2 percent, then 75.9 percent, and finally 78.6 percent of inspected premises were free of rats. Smith (3) recorded a natural decline of approximately 65 percent in farm premises infested with commensal rats in neighboring Thomas County, Ga., over the past decade. In addition to the natural environmental factors which would account for part of the decrease in the number of rat-infested farms within the eradication area, it is believed that certain other factors stemming from the typhus eradication program also were contributory. These factors are: (a) individual actions resulting from the creation of desire in the farmer to get rid of rats, and (b) the program's reduc-

tion of the number of rats to the point where differences in age and sex composition prohibited reproduction of those remaining. The latter factor was believed by Emlen and his colleagues (2) to be responsible for the very slow recovery of Norway rat populations which had been reduced to a few individuals.

Complement fixation tests of rat blood serums indicated that antibodies to murine typhus had disappeared from the rats in the eradication area by the end of the first year, although one rat with typhus antibodies was taken at the border adjoining a known typhus-infected premise. Three of the four rats with typhus antibodies trapped at the end of the second year (1956) came from a farm in the heart of the eradication area. This farm had had a roof rat infestation which eradication measures had failed to dislodge. One of the three rats with antibodies taken from this farm was a Norway rat, indicating the possible reintroduction of typhus infection from an outside source. At the end of the next year, no evidence of rat infestation could be found at this farm, possibly because of poisoning attempts by the owner. The fourth rat with typhus antibodies (1956) was trapped at a farm near the southern edge of the experimental region. It had probably emigrated from outside the zone since several other rats taken from the same farm had no antibodies to murine typhus. The supposition that typhus was not being transmitted from rat to rat in the experimental area was further strengthened by the absence of any evidence of previous typhus infection in the rats trapped at the end of the third and final year.

A recently published paper by Smith (4) comparing seasonal prevalence of typhus antibodies in rats with seasonal occurrence of important commensal rat ectoparasites indicates the importance of the oriental rat flea, *X. cheopis*, as the natural vector of murine typhus among rats and the relative unimportance of other common ectoparasites. Prior experience has shown that an average of at least 1 *X. cheopis* per rat trapped usually accompanies successful transmission of typhus from rat to man. No such estimate has been postulated for rat-to-rat transmission, but the averages of 0.2 and 0.4 *X. cheopis* per rat trapped in the experimental area at the end of 2 and 3 years follow-

ing eradication indicate the practical elimination from the area of the hazard to humans of typhus transmission from rats. Although the oriental rat flea and the tropical rat mite infested more rats at the end of the second year than at the end of the first or third years (table 3), this may have been due to weather conditions toward the end of the second year which favored these ectoparasites. In fact, no case of murine typhus in humans is known to have occurred in the typhus eradication area of Grady County since the cessation of eradication measures on May 4, 1954.

Summary

During a 10-month operational period, an attempt was made to eradicate murine typhus fever from the rural endemic foci in the southeastern quarter of Grady County, Ga. Intensive rat poisoning and applications of 10 percent DDT dust to rat-infested farm premises were the chief eradication measures used.

Four extensive inspections were made within the area after eradication measures ceased on May 4, 1954. A preliminary inspection made within 2 months after the eradication program ended indicated reinfestation of 5.2 percent of the farms nearest to those where rats were not completely eradicated. More complete inspections of the farms in the eradication area at intervals of 1, 2, and 3 years after eradication

showed that rats had reinfested 29.4, 33, and 41.7 percent of the farms from which rats had been cleared.

Typhus antibodies were found in 3 of 70 rats trapped in the area immediately after the eradication program. At the end of 1 year, the 1 rat with typhus antibodies among 139 rats trapped was believed to have emigrated from adjoining untreated territory. Four rats of a total of 142 trapped at the end of the second year had antibodies to typhus, while none of 148 rats taken at the end of the third year revealed typhus antibodies. No human cases of murine typhus are known to have occurred in the experimental area since the cessation of operational procedures on May 4, 1954.

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Studies on Radiation Hazards Scheduled

A new program to study the hazards of radiation will be initiated in 1958 at the New York University-Bellevue Medical Center through a \$500,000 grant from the Rockefeller Foundation.

According to Dr. Norton Nelson, director of the Center's Institute of Industrial Medicine, who will direct the activities of the program, attention will be given to radiation hazards for the general population as well as to special risks in industrial use.

Domestic Agricultural Migrants in the United States (map and table)

PHS Publication No. 540. 1957. 25 cents.

Prepared as a basis for planning health services, the map indicates the peak demand in 902 counties which were estimated to have 100 or more migrant workers from outside the county at the peak of the normal crop season. The table gives the population of these counties and the estimated number of migrants needed by each.

The basic data were obtained from the U. S. Departments of Labor and Agriculture and were checked by State health agencies.

Urban Fringe Sanitation A selected bibliography

PHS Publication No. 583 (Public Health Bibliography Series No. 18). 1958. By Warren F. Smith. 27 pages. 15 cents.

One hundred annotated references have been prepared to assist sanitary engineering personnel. The bibliography is organized under four subjects: water supply, sewerage, refuse, and planning, with further breakdowns as to administrative, economic, and technical articles for the water and sewerage portions.

Rabies: Methods in Laboratory Diagnosis

PHS Publication No. 568. 1957. By Ernest S. Tierkel and Helen O. Neff. 42 pages; illustrated. 25 cents.

Designed to provide a practical guide for workers concerned with routine rabies diagnosis, this manual presents techniques selected for their simplicity, dependability, and economy.

The subjects cover preparation of suspected tissues for laboratory diagnosis, microscopic examination for Negri bodies and performance of the biological diagnostic test. Information on packing and shipping specimens and regulations covering their transportation plus a sample animal history form and a list of selected readings are included.

Control of Domestic Rats and Mice

PHS Publication No. 563. 1957. By Bayard F. Bjornson and Charles V. Wright. 25 pages; illustrated. 25 cents.

This training handbook describes briefly rodent-borne diseases, such as murine typhus, plague, rat-bite fever, salmonellosis, and rickettsialpox, and discusses identification and biology of domestic rats and mice.

The role of sanitation, including proper storage, collection and disposal of refuse, as well as methods of rodent killing, trapping, rodenticides, and burrow gassing, are emphasized. Simple methods of rat-proofing, formulas for common rodenticides, and methods of controlling rodent ectoparasites are given.

Patients and Personnel Speak

A method of studying patient care in hospitals

PHS Publication No. 527. 1957. By Faye G. Abdellah and Eugene Levine. 33 pages. 30 cents. (Checklist forms for patients and personnel, \$3.00 per 100.)

The technique used successfully by 60 American Hospital Association member hospitals to evaluate their nursing services has been refined and made available in this manual.

The booklet discusses the value of studying patient care, how to get started, the responsibilities of study personnel, and how to tabulate and analyze the data.

Forms for gathering data and a tested checklist on which hospital patients, doctors, administrators, and nursing staffs can state their personal observations of gaps in service are included.

Information Leaflets

GOOD TEETH. *PHS Publication No. 405. (Health Information Series No. 83) Revised 1957. 11 pages. 10 cents.* Gives pointers on dental care for children from infancy through childhood. Discusses the value of fluoridation and tells at what ages topical applications of fluoride should be made.

SIMPLE GOITER. *PHS Publication No. 100. (Health Information Series No. 56.) Revised 1957. Leaflet. \$2.00 per 100.* Describes briefly cause, effect, prevention, and treatment of simple goiter.

GALLSTONES AND GALL BLADDER DISEASE. *PHS Publication No. 99. (Health Information Series No. 58.) Revised 1957. Leaflet. \$3.00 per 100.* Describes gallstones, the symptoms they produce, and emergency treatment. Discusses importance of consulting a physician.

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared by other Federal agencies.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications other than its own.

Rehabilitation of the Cardiac

PHILIP R. LEE, M.D.

Dr. Lee introduces a provocative approach to the most common form of disability, one which does not lend itself to the usual process of physical repair or vocational training. Public Health Reports will welcome papers dealing with specific applications of Dr. Lee's philosophy.

REHABILITATION of the cardiac is a complex process, properly initiated by medical, social, psychological, and vocational evaluation of the patient.

The cardiac may be an infant with congenital heart disease, a youngster with acute rheumatic fever, a miner with cor pulmonale, an executive with acute myocardial infarction, a farmer with hypertensive cardiovascular disease, or an elderly housewife with chronic rheumatic heart disease. The various etiological types of heart disease must be differentiated in the light of increasing numbers of therapeutic approaches available. For example, the prophylactic use of penicillin to prevent streptococcal infection in youngsters who have recovered from rheumatic fever has prevented recurrent attacks of rheumatic fever and has thus enabled children to live lives nearer normal.

Impairment and Disability

The patient with heart disease may suffer no disability as a result of his disease or he may be totally disabled. Impairment and disability are often considered to be synonymous, but actually, total disability means the inability to engage in work commensurate with his previous training and his skills and aptitudes, while impairment refers to any structural or functional abnormality. The person who has heart disease may have an impairment of structure or

function without disability, or he may be totally disabled with only a minor impairment.

Heart diseases are often associated with a protracted course often with a gradual cumulative impairment, and with a clinical picture that may be complicated by physical, psychological, social, vocational, or economic dislocations.

There may be a short period of severe physical handicap and total disability, followed by complete functional recovery without disability, as in the case of the patient who suffers a heart attack; there may be a gradual progressive downhill course, as in some patients with chronic rheumatic heart disease; there may be a long period of relatively good health with death due to unrelated causes; there may be chronic ill health followed by complete surgical cure, as in many patients with congenital heart disease; or there may be years of little or no handicap terminated by a year or more of increasing ill health and finally death, as in certain patients with severe hypertension. Between the extremes of sudden death and normal life may occur all varieties of physical and functional impairment, as well as physical, psychological, social, and vocational handicap or disability among patients with cardiac disease.

The physical handicaps of the cardiac are most often a diminished tolerance for exercise, easy fatigue, shortness of breath, swelling of the ankles, or anginal pain. Other less common symptoms may occur as a result of heart disease. Psychological handicaps may be greater than the physical. They are likely to take the form of fear of sudden death, anxiety, depression,

Dr. Lee, who has written a number of articles on rehabilitation, is with the Palo Alto Medical Clinic, California.

overconcern about the heart, hostility or rejection.

Although the great majority of patients with heart disease are able to lead relatively normal lives despite some organic impairment and many are able to work productively in industry, to attend regular school, to labor on the farm, or to carry out the manifold duties of the housewife, any individual with heart disease may be severely handicapped.

Evaluation

Rehabilitation of the cardiac should begin the moment he is stricken. The first step in this rehabilitation is proper evaluation, including assessment of the physical, psychological, social, and vocational status of the patient. This may be accomplished by the family physician without the aid of the social worker, psychologist, vocational counselor, and consultant cardiologist. If any of the latter are required, however, it is the responsibility of the patient's physician to be sure their services are made available.

It has been estimated that for 80 percent of the cardiac patients evaluation and the management of the total rehabilitation program can be carried out by the patient's personal physician, but for 20 percent of the patients a team approach is essential if the patient is to achieve his maximum level of function in society.

The medical examination should include a careful, accurate, and thorough history as well as a complete physical examination and appropriate laboratory studies. The physician should also assess the patient's functional capacity. The patient may be able to perform the ordinary activities of life without distress, or may find it difficult if he is recovering from an acute cardiovascular illness or if he has many psychological problems which alter his subjective response to exercise.

After the physician has estimated the patient's functional capacity, he should evaluate physical and emotional stresses in the patient's daily life to determine if the patient has the capacity to continue his normal activities. Considerable information is now available for this assessment, not only on the energy cost of a variety of activities, but also on environmental

stresses and on the stresses imposed on individuals by their emotional reactions.

Emotional problems are often of greater importance in rehabilitation than the physical limitations imposed on the patient by his disease. The physician can usually determine the major emotional problems if he allows the patient sufficient time to relate the details of his illness, his concerns about himself, his family, job, and future. Occasionally it is necessary to have psychological testing or psychiatric consultation or both.

Of considerable importance in returning a patient to work is the patient's attitude. Jones used a simple method to classify patient's attitudes toward work which he found correlated rather well with success or failure in vocational rehabilitation. The following was his classification. Good: actively seeking employment and cooperative in attempts to help him; fair: willing to work, but doubtful of his ability to do so; poor: not seeking work and maintaining he had difficulty in working; and, bad: obstructing attempts to find him work and claiming his heart made him unfit. Of the patients with a good or fair attitude two-thirds were resettled in productive employment while only one-third of those with a poor attitude and none with a bad attitude were resettled.

If the psychological assets are positive and the patient is strongly motivated, much can be accomplished by the individual, even in the presence of severe organic heart disease. If the patient is not motivated and cannot become so, the physician and other members of the rehabilitation team are likely to accomplish little even if the patient has no physical limitation.

In evaluating the emotional status of a cardiac, especially a child, the patient's family must be considered. Often the family will make the difference between success or failure in rehabilitation. If they are understanding and cooperative they can be of immeasurable aid, but if they are overprotective, fearful, or rejecting, rehabilitation attempts may meet with failure.

Sociologic Factors

The physical and psychological aspects of cardiac rehabilitation have received considerably more attention than have many of the soci-

ologic factors despite the latter's importance in rehabilitation. Limitations placed on many cardiacs by their physicians severely restrict their social opportunities as do the employment policies of many industries and the current interpretation and administration of many of our workmen's compensation laws.

When the social and vocational status of any cardiac is evaluated, the fact that the majority of cardiacs can live relatively normal lives should be kept in mind. The majority who labor in industry, on the farm, in the home, or who attend school are better off continuing in their usual work or habits of life than by radically altering them when no clear-cut indication to do so exists.

Points to be emphasized in the social history are the psychological factors to which may be added family relationships, economic status, housing, and education. In the vocational history, information should be obtained on specific characteristics of the job or work place, operations or activities involved, environmental conditions, wages, group pressures or other social pressures on the job, previous vocational experience or training, skill, adaptability, and interests.

For children, appropriate emphasis must be placed on the family, on the child's intelligence, education, interests, motivation, and potential for future activities. In this instance, skill may be developed and patterns established, whereas in older cardiacs often the only realistic approach is to attempt to restore the patient to his usual habits of life and work.

Individualized Planning

Parallel with the evaluation is the individualization of the rehabilitation program. Although two patients have the same organic defect they will not have the same personality, nor will their habits or environmental stresses be the same. These factors must be considered when giving the patient advice about diet, drugs, physical activity, occupation, recreation, sexual activity, emotional stress, smoking, and the variety of day-to-day problems involved in his rehabilitation.

In what is perhaps the single most important step in the rehabilitation process, the physi-

cian's unhurried discussion with the patient about his disease, the emphasis should be on the more optimistic aspects, particularly regarding prognosis and the ability of the patient to return to a reasonably normal and productive life. The patient should be told in some detail how he can best arrange his life to fit the circumstances. Often it is advisable to outline treatment procedures as well as the overall rehabilitation program.

The rehabilitation of any cardiac may involve family members, nurses, teachers, social workers, vocational counselors, psychologists, psychiatrists, surgeons, cardiologists, occupational therapists, dietitians, industrial physicians, employers, union leaders, personnel directors, fellow workers, and friends. Although many disciplines and individuals may be employed in the rehabilitation program, the patient's personal physician must remain his guide from the time of initial illness until the goal of rehabilitation, namely the return of the patient to the best life he can lead with what he has left, is achieved.

Summary

1. Rehabilitation of the cardiac is a complex process properly initiated by medical, psychological, social, and vocational evaluation of the patient.

2. The rehabilitation program must be individualized to meet the specific needs of the patient.

3. The single most important step in the rehabilitation of the cardiac is the physician's unhurried discussion with the patient about the nature of his disease, its treatment, prognosis, and how he can best arrange his life to fit the circumstances.

4. The rehabilitation of the cardiac may involve many different people, with diverse skills, but the physician must remain the patient's guide until the patient has returned to the best life he can lead with what he has left.

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Revised Regulations for Tuberculous Immigrants

Aliens with tuberculosis who are permitted to immigrate to the United States are now required to go promptly to a hospital for examination and necessary medical care, according to a change in immigration regulations announced by the Immigration and Naturalization Service of the Department of Justice and by the Public Health Service. Hospitalization as an inpatient is not necessary if the responsible physician determines that outpatient care is adequate. Earlier regulations provided for hospitalization "if required," without stating details on enforcement.

Public Law 85-316 of September 11, 1957, contains a provision permitting an immediate family member of an American citizen or of a resident alien to immigrate to this country although afflicted with tuberculosis. Other aliens with this disease are barred from admission.

Before receiving an immigrant visa, the alien must submit a statement from a State, Territorial, or local health officer, or from the director or a physician staff member of a hospital recognized by the Public Health Service as an institution for the treatment of tuberculosis, agreeing to supply any treatment and observation required for proper management of the alien's condition, in conformity with accepted local standards of medical practice.

This statement must also provide that the United States quarantine station at New York will be furnished a clinical evaluation of the alien, including necessary X-ray films, and a report of final disposal of the case. In each instance the statement of agreement regarding these services must specify the name and address of the hospital at which the services will be provided, and must stipulate that the alien will

be given care on an inpatient or outpatient basis when necessary after his arrival at the hospital.

In applying for his immigrant visa the alien must also submit:

- An affidavit from a sponsor or other responsible individual that financial arrangements for the alien's care have been made with the hospital, unless the Dependents Medical Care Act applies.

- Assurance that upon admission into the United States he will go direct to the specified hospital; submit to such examinations, treatment, isolation, and medical regimen as may be required; and remain under the prescribed treatment or observation, whether on an inpatient or outpatient basis, until discharged.

- Assurance that he will comply with the provisions of Sanitary Measures for Travel of Aliens With Tuberculosis. This applies only if the alien's tuberculosis is considered to be in communicable form, in which case he is given a copy of the document.

For purposes of these requirements, the Public Health Service recognizes a hospital as "an institution for the treatment of tuberculosis" if it is listed in Tuberculosis Beds in Hospitals and Sanatoria, Public Health Service Publication No. 518. Copies of this have been sent to State health departments and other local health agencies.

Immigration and Public Health Service officials have expressed the hope that when health departments or qualified private institutions and physicians are called on to provide care for an alien with tuberculosis who is seeking admission to this country, they will carry out the letter of the regulations in order that the spirit of the law may be observed.

Health Needs and Opinions of Older Adults

LENA DICICCO, M.S.P.H., and DORRIAN APPLE, Ph.D.

TO LEARN something about how older people perceive their health needs and how they meet them, an interview survey was conducted among 95 elderly persons living in a low socioeconomic district of Boston, Mass. Although the findings may be characteristic to some extent of the socioeconomic level of the group, they are undoubtedly related in part to the respondents' age. In any event, the group is a sample of potential consumers of public health services. Their behavior, attitudes, and opinions should be of value to public health personnel planning or administering services for such a population.

The study, carried out in 1955, was designed specifically to investigate the following factors and their interrelations: state of health and health care, satisfaction with health, respondents' appraisal of health needs and care, and use of mass media for health information. With a few changes, a number of the questions in the interview schedule were taken from the much more extensive schedule used in the survey in the Kips Bay-Yorkville Health District of New York City (1). Most of the interviewing was done by an interviewer with considerable training and experience on research proj-

ects of the Harvard University department of social relations. The remainder was done by DiCicco.

Characteristics of the Sample

A random sample of 158 persons 65 years of age and over was drawn from a single census tract within the Whittier Street (Roxbury) District of the Boston Health Department. According to the 1950 census, the total population of those ages in the census tract is 377. Median rental in the residential area is \$24 per month; about 35 percent of the housing is dilapidated or has no running water; less than 15 percent of the employed have "white collar" jobs or better; and more than half the population is nonwhite.

The sample yielded 95 interviews. Of the 63 nonrespondents, 26 were men and 37 women; 39 persons (16 men and 23 women) had moved, were deceased, or could not be found; 14 (9 men and 5 women) had working hours that prevented their being interviewed; and 1 man and 9 women refused to be or were incapable of being interviewed because of illness or a language handicap. The interviews averaged an hour in length. Only seven of the respondents showed any negative feelings about being interviewed.

Of the 95 respondents, 25 were between 65 and 69 years of age; 55 were in their seventies; and 15 were 80 or over. Twenty were white men, and 15 were Negro men; 40 were white women, and 20 were Negro women. Forty-four were born in the United States; of the foreign

Miss DiCicco, health educator, and Dr. Apple, sociologist, were members of the staff of the gerontology and chronic disease unit of the Harvard School of Public Health when the survey reported here was undertaken. Miss DiCicco is presently on the staff of the health division of United Community Services of Metropolitan Boston. Dr. Apple is with the Boston University School of Nursing.

born, 18 were born in Canada, 11 in Ireland, 7 in the British West Indies, and the remaining 15 in 13 other countries. The mean length of residence in this area of Boston was 40 years.

Twenty-nine of the respondents were married; 58 were widowed, divorced, or separated; and 8 were single. Besides the 29 married respondents, who were living with their spouses, 30 persons were living alone, 25 were living with relatives, and 11 were living with nonrelatives. Twenty-one reported owning their own homes, and 74 were tenants or lodgers. Fourteen persons had finished high school; 28 had attended high school; and 53 had not completed grammar school. Forty-six were Protestant; 40 were Roman Catholic; and 3 were members of other faiths; the others did not designate a religious affiliation. Eighteen had never worked; 14 were currently employed; and 63 had previously worked.

In summary, the sample included substantial numbers of whites and nonwhites, Roman Catholics and Protestants, native born and foreign born. The preponderance of women, the low educational level, the few still employed, and the small number living with spouses are characteristic of older persons. Their poverty and substandard housing are characteristic of the area in which they live.

The race and sex distributions of the sample were representative of the distributions of all persons aged 65 years and over in the census tract. The sample, however, tended to be older than the census tract population. Half of the 377 persons 65 years old and over in the census tract were in the 65-69 group, but only one-fourth of the sample were in this age category. The difference is probably due to the number of persons in the lower age group who were not interviewed because of their working hours.

State of Health and Health Care

The state of health of the respondent was determined through questions about the number of days spent in bed during the previous year, ailments or symptoms present at the time of the interview, and whether he was under treatment by a physician. Conditions were considered to be under treatment if medication prescribed by a physician was being taken or if the

patient had been seen by a physician within the previous 6 months.

Only two-fifths of the sample reported having been in bed because of illness during the previous year. Thirty-three persons said they had been ill once, and 4 had had 2 illnesses each. These 37 persons reported a total of 696 days in bed.

Forty persons said they had an illness under treatment at the time of the interview; 28 reported an illness not under treatment; and 27 reported no illness.

As shown in table 1, of the 208 ailments reported by 68 individuals, heart and circulatory diseases, diseases of bones and joints, and hearing disorders are the three leading categories. These are chronic diseases for which medical science has little to offer in the way of cure. Practice and opinion of the group surveyed, as brought out in the data that follow, reflect a conviction that aches and pains and physical limitations are a part of old age and a general skepticism that anything can be done about them.

Index of Health

From several questions we constructed a single index of health that would distinguish the more healthy from the less healthy persons. With such an index, we could test whether the more healthy differed from the less healthy with regard to other data that we gathered from our sample.

The index we constructed is known as a Gutt-

Table 1. Ailments and symptoms reported by 68 individuals

| Ailment or symptom | Number | Percent |
|---|--------|---------|
| Total..... | 208 | 100.0 |
| Heart and circulatory diseases..... | 48 | 23.1 |
| Diseases of bones and joints..... | 34 | 16.3 |
| Hearing disorders..... | 26 | 12.5 |
| Foot conditions..... | 18 | 8.7 |
| Gastrointestinal disorders..... | 18 | 8.7 |
| Nervous disorders..... | 18 | 8.7 |
| Kidney disorders..... | 16 | 7.7 |
| Vision disorders (including some in persons wearing glasses)..... | 15 | 7.2 |
| Diabetes..... | 3 | 1.4 |
| Respiratory diseases..... | 3 | 1.4 |
| Other..... | 9 | 4.3 |

Study Advisers

Assistance in planning the study was provided by a Harvard School of Public Health Advisory Committee composed of Dr. Robert B. Reed, Dr. Beryl Roberts, Dr. Claire Ryder, and Dr. Leonid Snegireff, and Mrs. Marie F. Gately of the Boston Health Department. Dr. Reed, associate professor of biostatistics at the Harvard School of Public Health, helped in selecting the sample and setting up tables as well as with general advice.

The study was financed through grants from the W. K. Kellogg Foundation and the Proctor & Gamble Fund.

man scale. This method of combining replies to several questions into a single score for each person was developed during World War II by social scientists employed by the Army to study experiences and opinions of soldiers (2, 3). It has been used extensively in sociologic research and has a number of advantages over other methods of combining several items of information into a single score. (Every Guttman scale reported in this paper has a coefficient of reproducibility of more than 0.90.)

For example, suppose we have information about the presence or absence of three traits, A, B, and C, in a sample of people. Suppose that these three traits are all indicators of a single underlying characteristic, such as healthiness, and that trait A occurs most frequently, trait B the next most frequently, and trait C the least frequently. If we find that persons who possess only one of the traits possess A, while those who possess two of them possess A and B, then the items form a Guttman scale. We have in our sample only four types of persons: those who have none of the traits, those who have A only, those who have A and B, and those who have all three. This staircase arrangement means that we can conclude that each type possesses a greater degree of the single characteristic underlying the traits than does the type preceding.

Item A in our index of health was based on replies to the question about number of days in bed. Item B was based on an index of satisfaction with health constructed from replies to

five questions: How would you say your health is now? Do you think your health is better or worse than that of other people your age? Is your health better or worse or about the same as it was 10 years ago? Does it keep you from doing things? Does it keep you from seeing people? Item C was based on responses to the question of whether the person was having any present trouble with his health.

Using this scale, we were able to distinguish four types of persons ranging from the most healthy to the least healthy.

As a test of validity, our state of health scale was cross-tabulated with the interviewer's rating of respondents on Zeman's rating scale of activity (4). Zeman's ratings are: (a) capable of unlimited and unsupervised activity; (b) capable of moderate activity in the neighborhood but perhaps requiring assistance for extended or tiring trips; (c) activities limited, needs supervision and assistance a good part of the time, is practically housebound, needs transportation for trips to doctor or clinic; (d) confined to bed or immediate vicinity; (e) totally blind or so self-limited that self-care is not possible. The correlation was 0.59, which is adequate evidence of the validity of our scale. (This and all other correlations were calculated by the formula for the phi coefficient, with both variables dichotomized as close to the median as possible. For this sample, a phi coefficient of correlation greater than 0.21 is large enough to be statistically significant at the .05 level.)

Health Care

We were interested in finding out whether persons who rated low on the state of health scale reported receiving more or less health care than those who rated high. To answer this question we constructed a Guttman scale of health care received. Item A was based on the question of whether the person has a physician or hospital to which he usually goes. Item B was based on replies to this question: Some people think it's a good idea to see a doctor for a regular checkup ever so often even when they aren't sick, while other people think there's no use seeing a doctor unless you have something wrong; what do you think? Item C was based on whether the person said he had

seen a physician for any purpose in the previous year.

We computed a phi coefficient of correlation between health status and health care using types as defined in the state of health scale and in the health care received scale. The two had a correlation of -0.24 , which means that there is a moderate but significant tendency for people who are healthy to stay away from health care (according to their report of their activities) and for the less healthy to receive more health care.

Characteristics of the Two Groups

We were also interested in what differences there were within the "healthy" and the "unhealthy" groups between those who received much health care and those who received little. By thus holding constant the effect of health, we hoped to find indications of the reasons that some persons received more health care than others.

Within each of the two groups, we investigated the relationship between health care and age, sex, race, marital status, native or foreign birth, education, economic level, and whether the person lived alone or not. Within the healthy group, a clear difference emerged in regard to place of birth, marital status, and economic level. (Our criteria for higher, versus lower, economic level were: respondent owns his own home or he is working or chief wage earner of the household is working.) All persons who were native born, married, and economically better off than their neighbors reported a low level of health care. As we proceed to those possessing any two of these characteristics, to those possessing any one of them, and finally to those who are foreign born, non-married, and of a low economic status, the proportion with a high level of health care steadily increases. The difference is great enough for the chi-square test to reject the null hypothesis at the .01 level.

The same relationship between health care and place of birth, marital status, and economic level tended to appear among the less healthy, though the relationship in this group is not great enough to permit rejection of the null hypothesis.

These data indicate that it is likely that hos-

pitals and physicians do not see a representative cross section of the population of older persons whom we studied. Therefore, health services for older people planned on the basis of knowledge of the needs, wishes, and life circumstances of patients may not be acceptable to those who are not seeking health care.

The apparent relation between the amount of health care and the three characteristics might be interpreted this way: All three characteristics have to do with social affiliation. The foreign born have disrupted their early ties by emigrating. Married people have a social tie which the widowed, divorced, and single do not have. Our measure of economic level is home ownership or employment, both of which are social ties. Since receiving health care provides an opportunity for association with other people, it may be that a desire for contact with other persons and a felt lack of social ties lead the foreign born, the nonmarried, and those with a lower economic status to obtain health care. Further research would be needed to test this interpretation. If it were found to be correct, then this motivation for seeking health care might provide a means to increase the utilization of health services by at least a part of the population of older people.

Satisfaction With Health

We hypothesized that a major variable in our sample's evaluation of their health was the degree of activity which a respondent felt he could sustain. Evidence to confirm this hypothesis was found in three ways.

First, interviewer ratings on Zeman's scale of activity had a correlation of 0.54 with our five-item index of satisfaction with health, previously described. This is a highly significant degree of correlation.

Second, the index of satisfaction with health had a correlation of 0.44 with a Guttman scale of respondent's reported activity. The activity scale was constructed from answers to four questions. These concerned (a) visits (sometimes or often) with relatives or friends, either in the respondent's home or elsewhere; (b) walks or rides (sometimes or often); (c) a trip "to town" in the past 6 months, and (d) church attendance (at least once a week).

Finally, a content analysis of statements made by respondents when they were asked how their health compared with that of others their age disclosed that one theme appeared much more frequently than any other. This was the theme of ability to get around, to get out, to do what one has to do. As one lady put it (age forgotten): "He gives me health and strength to get my work done. My 'tired' makes me fall down at night, but then I'm all right for the morning." And one 74-year-old man: "My health is better than some who are 25 or 30. I carry a big buffing machine up and down stairs all by myself."

On the basis of this evidence, we accept the hypothesis that, for a majority of these people, to be active is to be healthy. We may speculate that being active allows older persons to satisfy their need for independence and thus to live up to society's requirements. In this group, health seems to be important only as it affects an individual's capacity to carry on activities important to him.

These findings raise serious questions about the kind of health education that would be meaningful in getting this group under medical care, let alone preventive care. They often consider themselves well despite ailments so long as they can meet the requirements of everyday living.

Respondents' Appraisal

A person's ideas on what constitutes good health and good medical care are important in how well he maintains his health. A number of questions in the interview supply information on how these older people view their health needs and the care they receive.

Periodic Medical Examinations

Respondents were asked when they had last had a "regular, thorough checkup." Fifty-six reported having undergone such an examination within the previous 2 years, but further questioning revealed that only 19 persons, or one-third, had visited a doctor specifically for a checkup. The remaining 37, or two-thirds, explained that the "checkup" was given them when they went for treatment of a disorder.

Thirty-three persons, more than half of the

56, reported that their physical examination had been performed by a private physician.

As a rough measure of the scope of the examination given, information was sought as to how many of the examinations included a chest X-ray, a blood test of some sort, and a urine test. Only 20 persons had had all three and 10 had had none, as shown in the tabulation below. These findings indicate that the examination given most of these people was not a "thorough checkup," although they do not show anything about the adequacy of the examination with regard to the particular disorder under treatment.

| <i>Number of tests</i> | <i>Number tested</i> | <i>Percent tested</i> |
|------------------------|----------------------|-----------------------|
| 3----- | 20 | 35.7 |
| 2----- | 12 | 21.4 |
| 1----- | 14 | 25.0 |
| 0----- | 10 | 17.9 |
| Total----- | 56 | 100.0 |

All 56 respondents who said they had undergone a physical examination expressed satisfaction with the adequacy of the examination.

These facts point to a general misconception in this group as to what constitutes a "regular, thorough checkup," as this would be defined professionally. By the respondents' standards, any contact with a physician, regardless of how the physician might define the purpose of the visit, was apparently a "thorough checkup." It would be valuable to know whether this group is typical of the general population in its apparent lack of knowledge of diagnostic tools.

To obtain further data on attitudes about the value of preventive health services the sample were asked to agree or disagree with two statements: "I think it is a good idea to have a checkup ever so often even though I'm not sick." "Doctors are good people to keep away from when you're feeling well."

About half of the sample agreed with the first statement, but only one-third of the sample disagreed with the second.

In judging the responses to these questions, the consistency in the respondents' answers is important. About 78 percent of the group originally rejecting the idea of preventive care repeated their views when asked the second question. Of the 50 persons who, in answering the first question, professed belief in the idea of

a checkup even though not sick, only 50 percent were consistent in their answers to the second question. Even more significant is the small number of persons, only 19, who acted on their belief that a preventive physical examination is a good thing.

Some of the negative comments on the subject of preventive care include: "Why go to a doctor when you can always tell when you're getting sick." "Some older people are always running to doctors because they have nothing better to do, and are making themselves sick." "I don't want to worry till I have to." "If you go, he's got to find something wrong with you; it's his business."

The idea that you know when you are sick made some sense 50 years ago when a large proportion of the prevalent illnesses were infectious and were accompanied by symptoms that the layman could recognize as signs of illness. The idea seems particularly inappropriate, however, for an age group prone to chronic diseases, the onset of which may be slow and inconspicuous. It would be interesting to see to what extent these ideas are shared by younger adults who have grown familiar with the preventive aspects of pediatric care, for instance.

As long as people go on measuring health in terms of their ability to eat and sleep or keep going, they will reject the idea that a physical examination is necessary to determine health status.

Preventive Clinic Facilities

In contrast to a majority of the group's negative feelings about the value of a physical examination, about two-thirds stated that they thought older persons would use a special neighborhood clinic where they could get advice and a checkup free of charge. An opinion on this subject was sought in an effort to gain some inkling as to whether this group would use such a service if one should ever be made available.

This generally favorable reaction deserves close scrutiny. It is easy and costs nothing to say yes to an abstract question like this one concerning use of a nonexistent facility for which there will be no direct consumer cost. Also, this same group held few opinions on medical facilities with which they had not had

direct experience. Since the only clinic in the Boston area like the one described was not known to any of the respondents, it is difficult to regard these assents as anything but superficial. Expressed beliefs and practices of this group as revealed elsewhere in the study do not reflect a "felt need" for preventive medical services, however much we would like to think so.

Physicians

Fifty-three respondents said they had a private physician who usually took care of them. How had they selected him? Thirty-eight of them, about three-fourths, said he had been recommended by relatives or friends. Four had heard of him through a social worker, and 11 by various other means.

Respondents' standards for evaluating a physician were elicited by asking how a person can tell whether he can trust a doctor. As this question was added to the interview schedule after some interviews had been completed, we have replies from only 79 persons. One theme in the replies had to do with the doctor's technical competence: "You can tell by his background," or "His treatment works." Another theme had to do with appreciation of the doctor's personal qualities: "I like the kind of person he is," or "I like the way he does things." Table 2 summarizes the data.

Men and women differed significantly in their responses to this question (chi-square=8.3; $P < .02$). Men emphasized the more practical-sounding "satisfaction with treatment"; with women, the doctor's personality seemed to count most. Also, of 15 persons who said they trusted a physician because he was recommended by others (included in the category labeled "other"), 13 were women.

Only two persons named valid criteria for trusting a physician: one, the doctor's background; the other, his staff position in a hospital. The apparent lack of knowledge in this area is not surprising; knowing how to judge a physician presupposes a sophistication about medical matters not usually acquired except through special education or sustained contact with the medical world.

For the same reason, the patient's ability to evaluate his physician's treatment is to be ques-

Table 2. Reasons given by 79 respondents for satisfaction with specific physician

| Reason | Male | | Female | | Total | |
|---------------------------|--------|---------|--------|---------|--------|---------|
| | Number | Percent | Number | Percent | Number | Percent |
| Technical competence----- | 12 | 52.2 | 11 | 19.6 | 23 | 29.1 |
| Personal qualities----- | 6 | 26.1 | 25 | 44.6 | 31 | 39.2 |
| Other----- | 5 | 21.7 | 20 | 35.7 | 25 | 31.6 |
| Total----- | 23 | 100.0 | 56 | 99.9 | 79 | 99.9 |

tioned. As one person put it in stating his disadvantageous position: "If you're a patient, you *have* to trust a doctor."

The patient's need to personalize this dependent relationship with his doctor is captured in one woman's statement: "I *must* like him because the doctor will help me if I have confidence in him and if I trust his judgment."

This need to like the doctor as a person is difficult to fulfill within the framework of an overcrowded clinic where many older persons receive care and where treatment is not necessarily always by the same physician. If rewards in the way of treatment are scanty for this age group, how much more is there need for allowing this doctor-patient relationship to develop within the clinic setting!

In general, attitudes toward doctors were strongly positive. Eighty percent disagreed with the negative stereotype, "Doctors aren't really interested in what happens to you," and 73.6 percent denied that "doctors tend to treat younger people better than older people." Also, there were defending statements such as these: "If some old people don't get good service, it's their own fault because they're so cranky and critical." "They're so overcrowded, they do the best they can with what they have."

Medical Facilities

Respondents were asked to name medical facilities they had actually used among the six major hospitals in the Boston area, the city health department, the visiting nurse association, and nursing homes.

Fifteen persons stated that they had never used a hospital service, but the remaining 80 had had 144 hospital admissions. Opinions about 112, or four-fifths of the 144 admissions,

were frankly favorable. Ten persons had had experience with the visiting nurse association and three with the health department, each of whom expressed a favorable opinion of the facility. Respondents were also asked to give opinions on hospitals whose services they had never used, but most of them hesitated to comment without direct experience.

Knowledge and discrimination about medical care and public health facilities are not widespread. This is not surprising since most people are not interested in services until they need them. When they do, there is no readily accessible body of knowledge which could help them in making a wise choice of facilities; and even if there were, according to the data given here and elsewhere, their choice would probably still be based on recommendations of family and friends.

Perhaps the question of sponsorship of a special preventive clinic might be raised here. The desirability of a health department's undertaking this service should be explored carefully, with at least this observation in mind: Most of the group of older people in this study had never used any of the health department services, according to their statements on the subject. Moreover, the disadvantages of separating preventive and curative aspects of child care, for example, are becoming increasingly apparent. Planning of services for older people might well be done with an eye toward integration with facilities and services already known and used by this age group. Integration of a preventive service with other services is particularly important when the need for such a service is commonly unrecognized. Consideration should be given to any practice, no matter how administratively unorthodox, that would en-

hance the possibility of the services being understood and used.

Mass Media for Education

Since so much effort has been directed toward acquainting the public, chiefly through mass media, with some of the basic facts about tuberculosis, cancer, and diabetes, we asked our sample some questions to test their information about these diseases. More than two-thirds of the sample answered questions on tuberculosis and cancer correctly (table 3). Agreement with the statement that cancer can be cured was often qualified by a *doubting tone* or with an additional "so they say" or "they *say* it can." Perhaps information campaigns are allowing the public to make the correct responses while still clinging to old beliefs.

Only about half of the persons interviewed agreed that people with diabetes can lead a useful life, with 33 unable to give an answer. Although the prevalence of diabetes makes it seem likely that everyone is acquainted with the disease, the sizable number of "I don't know's" might reflect the feeling that one can't really judge what it's like for someone else to have the disease.

Questions were asked as to whether the respondent read articles about health in the newspaper or magazines or listened to health programs on the radio or television. There was no significant difference in information about diseases between those who use such media for health information and those who do not.

Of the 86 persons who can read newspapers, 52, or almost two-thirds, said that they read articles on health. However, very few could name columns that they read regularly. Of

the 88 persons who have a radio or television set, only 34, or approximately two-fifths, said that they listen to programs on health. Common replies were: "I don't know why I don't," and "I'm just not interested."

Sex, race, or satisfaction with health status produced no significant differences in responses to these questions.

The picture is quite clear here that, although many people might feel that the aged ought to be interested in knowing more about health and illness, the people themselves probably wish just the opposite, that is, to escape the infirmities coupled with the aging process.

Summary and Conclusions

An interview survey of 95 persons aged 65 years and over who reside in a low socioeconomic district in Boston, Mass., has produced some observations that may be of value to public health personnel in planning and administering services for a similar population.

The most common perception of health among this group was in terms of activity. Health was important only as it became poor health and interfered with daily activity and maintenance of independence.

Since perception of health is an important determinant of one's beliefs and practices in the areas of medical and preventive care, the implications of this perception are significant. It makes for difficulty in motivating such people to seek medical care for the many ailments that are not severely handicapping. And, as borne out by opinions and practices discovered in this survey, it makes even more difficult attempts to make preventive services meaningful.

Among the study group, there seemed to be

Table 3. Public information about tuberculosis, cancer, and diabetes

| Statement | Agreed | | Disagreed | | No answer | | Total | |
|---|--------|---------|-----------|---------|-----------|---------|--------|---------|
| | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| People can have tuberculosis and not know it. | 71 | 74.7 | 11 | 11.6 | 13 | 13.7 | 95 | 100.0 |
| Cancer, if it is found early, can be cured. | 68 | 71.6 | 12 | 12.6 | 15 | 15.8 | 95 | 100.0 |
| People with diabetes can lead a useful life. | 55 | 57.9 | 8 | 8.4 | 32 | 33.7 | 95 | 100.0 |

little appreciation of the newer diagnostic and therapeutic tools, and objective criteria for selecting and judging the quality of medical care received were almost completely lacking. Selection and evaluation of physicians and facilities were made almost completely on the basis of personal experience and opinion of family and friends.

There was little expressed need for preventive services, and for the most part these people had already-established patterns for using medical facilities, based chiefly on personal contacts.

These findings suggest that preventive services for older people probably should be approached from the point of view of integration with services that they consider well established. The services might be paid for by health departments but administered within hospital outpatient departments or departments of welfare.

The frequently mentioned "look at the whole man" is especially important when that man is part of our aging population. The things that give life meaning for him greatly influence the narrow sphere of activities which can be described as health behavior. Sound public health planning cannot be accomplished in a vacuum.

In some communities, public health responsibility might mean taking the initiative to get community concentration on the problem. In those where the framework for action already exists, responsibility might consist of taking

an objective look at all medical and public health services as they affect the elderly, putting new emphasis on already existing programs, and creating new services within whatever agency seems to offer the best chance of being used by the consumer in question.

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DOCUMENTATION NOTE

Tables presenting the data for the scales, correlations, and statistical tests described in this report have been deposited as document No. 5596 with the American Documentation Institute Auxiliary Publications Project, Photoduplication Service, Library of Congress, Washington 25, D. C. Photoprints may be obtained by remitting \$1.25; a 35-mm. microfilm copy by remitting \$1.25. Advance payment is required. Cite document number. Make check or money orders payable to Chief, Photoduplicating Service, Library of Congress.

Migratory Labor Notes Resumed

On April 1, 1958, the Department of Labor resumed publication of Migratory Labor Notes, a bulletin describing public and private activities affecting migrant agricultural workers and their families. Issued by the President's Committee on Migratory Labor, the organ first appeared May 11, 1955, and then, reflecting the small number of State migratory labor committees at that time, appeared only intermittently thereafter, once in November 1955 and again in May 1956. Publication on a more frequent basis was stimulated by the growing number of State migratory labor committees, which now total 17, and by the requests of many State and community organizations.

Whether to use septic tank systems to provide needed sewage disposal facilities is an increasingly critical question facing the ever-expanding suburbs.

The Septic Tank System in Suburbia

JAMES B. COULTER, B.S., M.S.

THE WIDESPREAD use of the septic tank has come as a result of an unprecedented demand for housing in suburban areas. Before attempting an evaluation of the septic tank as a means of sewage disposal, it is well to review the factors promoting its use. Since the septic tank is intimately connected with the house-building industry, the review must consider that industry and the forces governing its activities.

After a long freeze during the war, construction got under way in the late 1940's with a mass movement of people to the suburbs of population centers. It seemed reasonable at that time to believe that this shift in population resulted from the wartime backlog of housing demand, that eventually construction would catch up with demand leaving relatively stable communities with new outer boundaries, and that permanent facilities could then be installed to replace the temporary devices used during the expansion period.

It now appears that this reasoning was in error. The tremendous increase in the birth rate following the war was contrary to all predictions. In 1940, the consensus was that the population of the United States had become relatively stationary and perhaps would even

begin to decline. Even as late as 1946 a population of 153 million was forecast for 1960, and an ultimate peak of 164.5 million was predicted for 1990. The great increases in marriages and births following the war made these predictions appear ridiculous. The present population is more than 171 million, and an estimate of 180 million now seems logical for 1960. In fact, during the past 10 years population increase has consistently exceeded the estimates.

The number of immediate housing starts is more nearly associated with new family formation than with population increase. The formation of new families is sagging at present. One reason may be that people of marriageable age are now being drawn from the low birth rate years of the depression, but the high birth rate after the war should bring a population wave in the marriageable age commencing in the late 1960's. Even now we are watching a wave of children pass through grade school. In a few years they will be in high school, later in college, and then they will marry and become prospective home owners.

Family income is another factor that greatly influences house building and home ownership. In spite of increases in the cost of housing, rising family income has brought home ownership within the reach of a large portion of the Nation. The percentage of owner-occupied dwellings rose from 43.6 percent in 1940 to 55 percent in 1950, and a further increase to 60 percent is predicted for 1960 (1). There is also

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good reason to believe that a rising family income, coupled with modern financing, will lower the age at which first homes are bought.

Suburban Expansion

Considering these facts, housing starts are expected to continue at the present rate of approximately 1 million a year for the next 4 years. Subsequently, the number of starts should steadily increase to a possible 2 million or more a year in the 1970's.

The location of new housing in relation to the central city is extremely important to any consideration of the septic tank's place in fringe area sanitation. Since 1950, practically all of the population increase has been registered in the 172 standard metropolitan areas, but the largest gains have been made on the fringes of the parent cities. This trend is expected to continue (2). To be realistic, we must conclude that the limits of the parent cities are virtually fixed by a number of factors, including the will of the people. Buildingsites within the corporate limits served by a sewerage system are already scarce and are priced out of the speculative house-building market. Therefore, the vast majority of new houses will be built in the suburbs at an ever-increasing distance from the parent city.

Because of these circumstances, the highway-building program may have more impact on housing location than any other factor in history. Approximately \$40 billion of the estimated \$100 billion to be spent on modern roads in the next decade will be spent in metropolitan areas. As a result, expressways of limited access will lead from the countryside into the heart of all major cities. Since time and not distance is the major consideration of commuters, the expressways will make land, considerably distant from the city, available and attractive for housing. Clearing rights of way during the construction of the highways will generate more pressure for the suburban movement. One noted economist estimated that from 300,000 to 400,000 houses a year demolished in the highway and urban renewal programs will have to be replaced and relocated. Although the estimate appears high, the demolition of houses is undeniably another factor in forcing people to the suburbs.

With the highways will come restaurants, motels, shopping centers, and other service installations. Industries will also locate along the highways, creating still further pressure for fringe area housing. All of these buildings, requiring sewerage and other community facilities, will intensify sanitation needs.

An appraisal of these facts and trends leads to a sobering conclusion. The expansion of standard metropolitan areas is not a passing phase. Rather, we have seen the start of a trend that may continue into the 1980's.

We are entirely unprepared to provide adequate sanitary facilities of all types in a dispersed community of the proportions visualized. The problem of sewage disposal is already acute. In fact, to dispose of sewage properly in an expanding suburban area from the time the first house is occupied until the area is fully developed is perhaps the most complex problem ever faced by the sanitary engineering profession.

Other disciplines are also concerned, but the basic responsibility for supplying essential sanitary facilities is vested in the sanitary engineer. Unless he seizes the initiative and becomes a strong leader, the situation will continue to deteriorate and confusion will increase.

Uses and Drawbacks of the Septic Tank

The problem of sewerage facilities for the rapidly developing, dispersed urban complex springing up around the population centers has no universally acceptable solution. The usefulness and the limitations of each method must be reviewed according to specific circumstances, and the method that can be financed and that shows the greatest promise as a permanent solution should be selected. There is danger in advocating one solution to the exclusion of all others. Conversely no usable solution should be discarded on the basis of experience arising from abuse or improper use of that solution.

The septic tank system, a term I am using to mean the method of on-lot disposal by soil absorption, can be satisfactory for individual homes in a developing suburban area. However, its use must be governed by a number of stringent conditions to avoid extremely unsatisfactory results. When properly used, the system has these advantages:

1. Sewage treatment is complete; the effluent is disposed of on each lot, and each home owner is responsible for his own system.

2. The method is compatible with both the pattern of construction in the United States and the requirements of health authorities.

3. Sufficient capacity to serve each home in a development is added as the house is built.

In general, the usefulness of the septic tank system decreases as the volume of sewage from the individual establishment to be served increases. This limitation is serious when schools, shopping centers, industries, and other larger installations are contemplated for the same general area as the housing. Even though septic tanks may be satisfactory for the individual houses, their use may thwart the construction of a unified sewerage system capable of serving the larger establishments.

The septic tank should never be used where conditions are improper for successful operation. Although frequently used as a temporary measure, the septic tank is actually a poor interim device. Septic tanks have often been permitted in soil where there was little, if any, chance for successful operation, on the assumption that adequate sewerage service would be provided as soon as the population density reached the point where it was practical. Theoretically the temporary use of septic tanks may appear attractive, but practical considerations work against the plan. Some of these considerations are:

1. Immediate failures create nuisances and public health hazards.

2. Many home owners, fearing the effect on property values, refuse to admit that failures are occurring, and do not support remedial action by a community.

3. Not all systems fail at the same time, and home owners who are not having trouble, or who have recently spent sizable sums to repair their systems, are reluctant to agree to community action.

4. There will always be resistance to bond issues and higher taxes. The expense and inconvenience of tearing up streets and lawns to install a community system stymies action until the need is critical.

5. The expense of installing a collection system in an established neighborhood is several

times the cost of the same system in raw land.

Other methods of interim treatment to protect public health should be devised so that the collection system is installed when the houses are constructed, thus eliminating the inconvenience and double expense.

Conditions for Satisfactory Use

A septic tank can be used satisfactorily under certain conditions. These conditions have been reported in a number of technical publications and described in detail in the *Manual of Septic Tank Practice* (3). If recommendations for sewage systems were based on these conditions, the septic tank system would be rejected where it will not work, and complaints stemming from malfunctioning systems would be tremendously reduced. Almost equally important, a system installed under proper conditions which later fails due to misuse, lack of maintenance, or old age can be corrected at the home owner's expense.

Control by a strong, well-organized health department and a sound ordinance are essential to prevent abuses of this system. A good ordinance defines the soil conditions suitable for septic tanks, requires enough usable area on each lot for two complete disposal fields, empowers the proper authority to establish minimum requirements for both septic tank and disposal field, and requires an approved permit before construction starts, individual design and construction by competent, responsible, authorized parties, and a final inspection of the system before it is covered.

The regulation should set forth the soil prerequisites for use of a septic tank system. A reliable percolation test is time consuming and requires great attention to detail. Some health departments feel that the evaluation of land is not a government function but part of the engineering services to be borne by the developer. For this reason, a number of county departments require that every application for a septic tank permit be accompanied by a log of the subsoil and results of percolation tests performed under the direction of a licensed professional engineer or another equally responsible person.

The regulation should also specify the mini-

imum available area that must be provided on each lot for the disposal field. Generally, this is a better practice than specifying lot size; the shape of the lot, the location of the house and driveways, and undesirable terrain features often make it difficult, even on large lots, to find a suitable location for the absorption field. The areas reserved for the system should be large enough to replace the disposal field completely, if necessary.

At the county level, authority to issue septic tank permits is vested in the health department or the building department, but invariably complaints are handled by the health department. Where dual authority and responsibility exist, cooperation between the two departments is essential so that no permit is issued unless the soil conditions are satisfactory and the system is designed in accordance with the regulation.

Inspection is necessary to see that the system was constructed in accordance with the permit and that good construction practice was used. A builder has sometimes been required to remove tile and rock and rework trenches to remove smeared and sealed surfaces. It is necessary also to check the provisions for storm water runoff, the house sewer for stoppages, the tank inlet for clearance, and the distribution box for level, as well as the capacity and construction details of tank and disposal field. Most counties prefer to have their own man make the inspection. The system should be covered as soon as the inspection is completed to protect it from rain and accidental damage.

Important Factors

Soil is the most important natural factor, and the only uncontrollable one, governing the successful use of the septic tank system. To be useful for subsurface disposal of sewage from a large number of homes, an area must have at least 4 feet of cover between the bottom of the disposal field and rock or other restraining formation; the ground water table must be at least 4 feet below the surface of the ground; and the soil must have an acceptable, sustained percolation rate.

For isolated dwellings it may be possible to shade some of these requirements, but for subdivisions all of them must be met. Unfor-

tunately, more than half of the soil in the United States is unsuitable. Furthermore, unsuitable soil is likely to be found on high ground desirable for house building, while suitable soil is likely to be in the bottom land desirable for agriculture. Because no practical method of improving soil for this purpose has been found, the wise builder has learned to make a preliminary investigation before purchasing a tract of land for housing development.

Design starts with the capacity of the system. As water consumption and modern appliances have increased, the concept of increased tank capacity has been readily accepted. Surprisingly, there is resistance, or at least apathy, to enlarging the absorption area even though it is the absorption field that ultimately disposes of the daily volume of liquid.

The relationship between soil area and life of the system is difficult to convey, but it exists nevertheless. Each year an increment of the available absorption area is exhausted and becomes useless for leaching. When the remaining area no longer absorbs the daily volume of liquid the system fails. A 3-bedroom modern house requires approximately 1,000 square feet of design area in a 60-minute soil. Few existing recommendations of local health departments meet that standard. Location, layout, grade, and details of construction are also essential to good design, and for the most part are adequately covered in present recommendations.

Careful construction is as important as good soil. Good construction cannot improve the soil, but good soil can be ruined by poor construction. Within my experience, most early failures of well-designed systems in good soil can be traced to improper construction. Perhaps the worst offense is working the soil when it is too wet. Surfaces are smeared and effectively sealed before any sewage is applied to the system. Walking or working on the absorption surface will compact and seal it prematurely. Raking the sides and bottom of the trench after the soil is relatively dry, and removing all loose rakings before the gravel is laid in the trench is strongly recommended.

Another common fault is to set the distribution box so that most of the liquid goes to one trench. This practice is especially serious and

always leads to failure on sloping ground where the overloaded trench can be relieved only through surface seepage. Occasionally, the box is set correctly and later disturbed by a truck or other piece of heavy equipment running over it.

Open trenches are seldom protected from rainstorms, and surface water loaded with silt is permitted to run into them. Another fault is to permit roof drainage to run over the ground above the disposal field. Wet weather failures can often be traced to this cause. An assortment of articles including tools, rags, lunches, and gloves have been left in house sewers. A frequent mistake is to set the septic tank backwards. The inlet baffle is sometimes broken off, or only a narrow crack is left for sewage to pass through when the house sewer is pushed too far into the tank. The list of construction deficiencies can run into a full scale treatise, but fortunately, installation techniques have improved tremendously in the past few years and are continuing to improve.

Proper use of the system is essential to long and trouble-free operation. Even with good soil, correct design, and proper construction, the home owner can misuse his system and cause it to fail. Using water wastefully or adding appliances can overload the system. Maintenance is simple but essential for a long period of efficient performance. The tank should be inspected annually and cleaned before sludge reaches the level where it is carried to the disposal field and damages the soil. On a lot of sufficient size with the septic tank located properly, failures due to abuse of the system can be corrected by installing a new disposal field. This is of course expensive, and when the home owner is informed of the dangers of abuse and the expense of installing a new disposal field, he is usually very cooperative about proper maintenance of the system.

Summary

The population of the United States is increasing at a rate far in excess of that predicted as late as 1946. Substantially all of the in-

crease is being absorbed in the fringes of the standard metropolitan areas. The growth and decentralization of metropolitan areas is not a passing phase, but rather a major population trend that will continue for many years. The construction of new housing in undeveloped areas creates a problem of sewage disposal of a complexity and magnitude never before faced by the sanitary engineering profession.

The change in community development from the tightly knit parent city of 20 years ago to the sprawling urban complex of today calls for reorientation of plans, philosophy, and techniques if costly errors are to be avoided. The usefulness and limitations of each method of sewage disposal should be reviewed in the light of specific circumstances, and the method that can be financed and that shows the greatest promise as a permanent solution should be selected.

The septic tank system can be a satisfactory means for disposal of sewage from individual houses in a developing suburban area, but its use is subject to a number of stringent conditions if extremely unsatisfactory results are to be avoided. The septic tank is a poor temporary measure, and it should never be used when conditions prohibit its successful operation. In general, the usefulness of the septic tank system decreases as the size of the individual establishment it is to serve increases.

The essential conditions for the satisfactory use of the septic tank system are effective regulation and control, suitable soil, and proper design, construction, and use. Sufficient area should be provided on each lot for replacing the absorption system in case of failure.

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Without additional personnel or funds and without appreciably affecting the amount of time spent on other duties, a county health department has established and is now expanding a home safety program based on daily reporting of accident hazards by its field staff.

Growth of an Accident Prevention Program

THOMAS H. GRAY, M.S.P.H., and GEORGE V. TRUSS

AFTER 2 years of studying and experimenting with integration of home accident prevention activities into the routine duties of the department's field staff, the Jefferson County (Ala.) Department of Health has developed a home safety program that is showing definite signs of progress and merit.

Like many other health departments, the Jefferson County agency for many years has recognized and expressed concern about the problem of accidents. Ever since reliable records have been available in Jefferson County, accidents have appeared among the leading causes of death. Safety has been taught by the public health nurses since the beginning of maternal and child health programs. Accident prevention has been a side result of the general sanitation program, although the activities have not been specifically directed toward that goal. Because of insufficient funds, lack of personnel, and a heavy schedule of other duties, no attempt was made to give special emphasis to accident prevention until 1954.

In 1954 the health department decided to remove accident prevention from the realm of thought and discussion and to develop specific plans for active work in home safety. This decision was made without the prospect of ad-

ditional funds or personnel. In fact, the department was seeking some type of program that could be carried out without much added cost.

Advances in the control of the acute communicable diseases and improvement in maternal and infant mortality rates indicated that greater returns from the field staff's time might be realized if safety instruction were made a part of the home visits. Hospitalization and emergency treatment of patients injured in accidents were increasing an already heavy economic burden of medical care for the community's needy. Discontinuance of the local chapter of the National Safety Council also added impetus to the establishment of a health department accident prevention program. Furthermore, the fact that accidents ranked fifth among the leading causes of death in the county during 1954 definitely pointed to the need for such a program. As shown in table 1, home accidents accounted for more than one-third of all accidental deaths in Jefferson County during the 5-year period 1952-56.

As a first step in creating a plan of action against home accidents, a home accident prevention committee was formed within the health department. The committee was composed of the health officer and the directors of the bureaus of public health nursing, communicable disease, sanitation, vital statistics, and health education. Conferences were subsequently held by the committee with home acci-

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Table 1. Number of deaths by accident class, Jefferson County, Ala., 1952-56

| Accident class | 1952 | 1953 | 1954 | 1955 | 1956 | 5-year total | |
|--------------------|------|------|------|------|------|--------------|---------|
| | | | | | | Number | Percent |
| Occupational..... | 36 | 27 | 29 | 38 | 28 | 158 | 11.7 |
| Home..... | 105 | 83 | 93 | 104 | 77 | 462 | 34.3 |
| Motor vehicle..... | 108 | 106 | 107 | 108 | 119 | 548 | 40.7 |
| Other public..... | 44 | 35 | 25 | 24 | 51 | 179 | 13.3 |
| Total..... | 293 | 251 | 254 | 274 | 275 | 1,347 | 100.0 |

dent prevention specialists of the Public Health Service to obtain advice and guidance in establishing a local program.

Familiar questions arose in meetings of the home accident prevention committee. Where do most accidents occur? How do they happen? Who gets hurt? What is the extent of the problem? What seasonal hazards should be given emphasis?

Morbidity Surveys

To try to answer these questions and to provide data about the nature and extent of non-fatal home accidents in the county two surveys were made in 1954, one in March and the other in June. In addition to collecting data, the surveys were conducted as a means of stimulating interest in home safety among the staff and to provide discussion material for inservice education. The surveys were made also with the idea that the data might be helpful in establishing a baseline for use in measuring indications of progress made in reducing home accidents.

During the survey months every public health nurse, sanitary inspector, and communicable disease officer carried a supply of mimeographed questionnaires. In each home visited they asked whether an accident which disabled the victim for 1 day or more had occurred in the previous month to any member of the household. For each such accident the questionnaire was completed. In every home visited, the name, age, and sex of all household members were recorded to provide a population basis for the study.

It was not considered practicable to visit homes for the sole purpose of making inquiries

regarding home accidents. Generally, therefore, the survey was restricted to the homes that the field staff visited while carrying out their regular duties.

The surveys provided information regarding the accident experience of nearly 48,000 persons living in 10,294 homes. Since the families interviewed included only those visited by the staff in connection with routine health department activities and therefore were not necessarily a representative sample of the county's population, caution was observed in interpreting the results.

The March survey revealed 103 nonfatal home accidents among 24,191 persons. On an annual basis, this means a rate of 55.4 per 1,000 survey population. The 85 home accidents recorded in the June survey gives an annual rate of 42.5 per 1,000 survey population. Falls (39 percent), cutting or piercing injuries (22 percent), and burns (20 percent) were the three principal causes of the accidents, accounting for four-fifths of the injuries reported in the two surveys. Sixty-eight percent, or 128, of the 188 accidents reported in the surveys were in persons under 15 years of age. Only six accidents occurred to individuals 65 years old or over.

No morbidity surveys have been made in Jefferson County since 1954, but the department's accident prevention committee has been considering conducting one in the near future.

Accident Hazard Reporting

Armed with the information from the survey about the principal causes of accidents and about age and sex differentials, and with a more enlightened staff, the health department began

considering ways to attack the problem of home accidents.

We decided that a daily report on accident hazards observed in each home visited would be the most productive and most practical method of integrating accident prevention into the routine activities of the field personnel. Accident prevention efforts would thus admittedly be limited to that segment of the population visited by the health department personnel for other purposes, but we believed that the procedure would nevertheless serve two important purposes: First, the requirement of a report every day would keep each employee safety conscious and constantly aware of the home accident problem. Second, analysis of the data reported would provide statistical information for evaluation and planning of other measures. Moreover, this type of activity could be carried out without additional staff or travel expense.

A special form for reporting home accident hazards was prepared. On it the public health nurses, the sanitary inspectors, and the communicable disease officers were expected to enter each day the number of hazards observed, the number called to the householder's attention, and the number corrected or eliminated, along with a brief description of the hazard. Also required was the number of persons given in-

struction in home safety. The form, shown below, has been in continuous use since March 1, 1955.

The health department's bureau of vital statistics prepared summaries of the hazards reported during the 10-month period of 1955 and during 1956. Copies of the summaries were distributed to all employees so that they might see and study as a whole the accident problem in the homes visited by the field staff.

The number of home accident hazards observed and the number known to have been eliminated are as follows:

| | <i>Observed</i> | <i>Eliminated</i> |
|----------------------------|-----------------|-------------------|
| 1955 (March-December)----- | 6,623 | 1,825 |
| 1956 ----- | 9,874 | 2,290 |
| Total----- | 16,497 | 4,115 |

During this period the field staff gave person-to-person home safety instruction to 21,147 individuals. Generally this instruction related to a specific hazard in the home at the time of the visit.

The hazards observed can be classified as:

1. Structural deficiencies potentially dangerous as direct or contributing causes of falls and fire burns. These included defective flues and electric wiring, defective steps, and holes in floor.

2. Poor housekeeping, as revealed by yards

Home Accident Prevention Supplemental Daily Report

| Description* | Number of home accident hazards | | |
|--------------|---------------------------------|------------------------------------|------------|
| | Observed | Called to attention of householder | Eliminated |
| | | | |
| | | | |
| | | | |

*List hazards, such as unprotected open grate, improper storage of medicine or matches, unanchored rugs, broken glass in yard, unlighted basement steps, etc.

Number of persons given home accident instruction-----

Signed_____

Date_____

Title_____

cluttered with broken glass, nails, and other debris, accumulation of papers and other inflammable materials, and floors littered with objects that might cause falls.

3. Lack of supervision of infants and young children, and of the aged, particularly the physically and mentally handicapped.

4. Unsafe practices of adults, such as smoking in bed, using chairs or boxes instead of stepladder, and starting fires with kerosene.

5. Indifference and neglect on the part of householders in providing a safe environment in and around the home.

The address of the home visited was not indicated on the field report, but a great many of the homes listed as having structural hazards were known to be occupied by persons of low economic status. In view of this situation, the number of structural hazards reported as eliminated was encouraging.

The reports provided strong evidence that parents in many homes failed to supervise the activities of children and to give proper care and attention to infants.

Discussion of the hazards with the householders frequently indicated that they were aware of the deficiencies but that they had neglected to take corrective action. Neglectfulness most often prevailed in homes of the lower income group, who were financially unable to provide proper safeguards. This fact pointed to the need for encouraging householders to improvise with scrap lumber and other available materials such things as fireplace screens and porch and step railings.

The hazards found during 1956 ran the whole gamut of accident-producing situations. The principal hazards, according to the kind of injury likely to result, are listed in the accompanying tabulation, with the total number in each main category and of each type (in parentheses) eliminated.

Hazards were recorded as eliminated if corrections were made during the field worker's visit or if observed to have been corrected on a subsequent routine visit. Except for certain major hazards, visits were not made specifically to determine whether or not recommendations for eliminating hazards were carried out. It is therefore not possible to assess the program in terms of the proportion of hazards actually

Number of Hazards Eliminated

| | |
|--|-------|
| Falls..... | 369 |
| Defective steps or porches (260); no handrails or balustrades for porches or steps (21); unanchored throw rugs (16); inadequate light in hall or stairs (10); toys, playthings, other objects on floor or walkways (213); miscellaneous (49). | |
| Burns..... | 313 |
| Unprotected open fireplaces, space heaters (47); inflammable objects too close to heating equipment (13); child playing with matches (38); improper disposition of lighted cigarettes (19); unsafe storage of matches (61); hot liquids in reach of children (54); miscellaneous (81). | |
| Poisoning..... | 179 |
| Improper storage of medicine (104); of poisons and household chemicals (48); of fuel oil (26); miscellaneous (1). | |
| Electric shock..... | 17 |
| Defective wiring, worn cords, improper installation of electric wiring, unsafe use of appliances (17). | |
| Drowning..... | 3 |
| Uncovered wells or cisterns, unprotected fish pool, child playing in tub unattended (3). | |
| Cuts, lacerations..... | 704 |
| Broken glass, tin cans in yard, boards with protruding nails (364); child playing with knives, scissors, other cutting instruments (184); sharp objects in reach of children (41); miscellaneous (115). | |
| Firearms..... | 6 |
| Firearms in reach of children (6). | |
| Suffocation..... | 63 |
| Abandoned refrigerator with latch unremoved (11); infant sleeping with parent (40); too much cover on infant (12). | |
| Strangulation..... | 55 |
| Baby nursing from propped bottle (55). | |
| Ingestion of foreign body..... | 77 |
| Child with pennies, marbles, or other objects in mouth (77). | |
| Miscellaneous and unclassified..... | 304 |
| Total..... | 2,290 |

eliminated. It is reasonable to assume that many more unsafe practices have been corrected and dangerous environmental conditions removed as a result of the safety instruction given than the figures in this paper would indicate.

Neither is it possible to determine the number of injuries prevented and the number of lives saved, but the fact that a substantial number of accident hazards are being removed from Jefferson County homes each month is an indication of the program's value.

Many of the hazards reported as corrected were relatively unimportant and at the worse might have resulted only in minor cuts, lacerations, or injuries of slight severity. However, a number of death-producing hazards, such as abandoned ice boxes, uncovered wells, and improper storage of medicine, poisons, and household chemicals, were also recorded as eliminated.

Program Expansion

The department's accident prevention activities were expanded considerably in 1957. Safety education was accelerated through the use of newspapers, radio, and television. Contacts with various community organizations began to pay dividends as evidenced by an increased interest in home safety and mobilization of efforts to reduce the number of home accidents. The Jefferson County Medical Society, the hospitals in the county, and the health department together formulated plans for an active poison control information center and emergency treatment stations. The fire department and the gas and electric companies agreed to provide inspection services for homes upon the request of the health department.

The accident hazard detection program was extended to meat markets, restaurants, grocery stores, and other food-handling establishments visited by sanitary inspectors. Correction of many unsafe conditions and practices in these places, such as improper use of sterilizers and use of broken ladders in storerooms, were recorded during the first 6 months of 1957. It is also noteworthy that one of the sanitary inspectors was instrumental in having a new fire escape installed at a local maternity hospital.

Perhaps the greatest contribution to the accident prevention movement during 1957 was the adoption of a housing code by the city of Birmingham. The new code provides for the immediate correction of existing hazardous conditions as well as for minimum standards for health and safety in all new construction.

Safety features included in the housing code relate to provision of unobstructed and minimum head room for doorways leading outside, installation of railings on unenclosed structures over 3½ feet from the ground, and provision of guard railings on steps containing five risers or more. The new code also states that windows used for ventilation shall have screens; hallways and stairways shall be adequately lighted; and porches and steps shall be so constructed that they will support the normal load expected.

The Birmingham City Commission named the Jefferson County Health Department as the agency for administering the new code and provided a supplemental appropriation for employing additional personnel to carry out its provisions.

Since the adoption of the code, space has been provided on the accident hazard report form for recording addresses where major or special hazards exist, and more intensive followup of the conditions is planned. Significant hazardous conditions are referred to the bureau of communicable disease control for followup and correction. The responsibility was given these staff members because less time is now required for communicable disease control work.

Inservice Training

Training of staff personnel has been carried on in small groups periodically. It has been designed not only to impart information, but to maintain interest in the program. Safety check sheets have been given to staff members for a safety evaluation of their own homes. Group discussions about hazards found during visits and of the accident hazard summaries prepared by the bureau of vital statistics have taken place.

During the training sessions it has been emphasized that changing attitudes and behavior is even more important than eliminating the hazards. The hazards found in homes merely help to create interest in home accidents and to

Table 2. Home accident fatalities, Jefferson County, Ala., 1925-56

| Years | Number of deaths | Rate per 100,000 population |
|----------------------|------------------|-----------------------------|
| 1925-29 ¹ | 109 | 27.3 |
| 1930-34 ¹ | 81 | 18.5 |
| 1935-39 ¹ | 96 | 21.3 |
| 1940-44 ¹ | 89 | 18.5 |
| 1945-49 ¹ | 95 | 18.0 |
| 1950-54 ¹ | 94 | 16.2 |
| 1955 | 104 | 17.0 |
| 1956 | 77 | 12.4 |

¹ Average for the 5 years.

provide a learning situation. No matter how many hazards are discovered and recorded as eliminated, accidents will continue until individuals accept the need for making their homes hazard-free and until they begin to practice safe ways of doing things.

Preliminary Evaluation

The forms for reporting accident hazards have served the useful purpose of creating an awareness among the staff of the numerous and complex problems associated with home accidents. In addition they have provided an index of the staff's ability to integrate home safety with their routine duties.

Both the number of home accident fatalities and the death rate for home accidents in the county show a decreasing trend over the past years, as revealed in table 2.

This decline is not assumed to be due alone to the activities of the department, for there have been other agencies, organizations, and groups active in promoting home safety. It is believed, however, that during the period March 1955 to December 1956, the staff's contact with 21,147 individuals in the county, the elimination of at least 4,115 hazards, and the effort to encourage practice of safety has contributed to the downward trend in the lives lost through home accidents.

The amount of staff time devoted to home accident prevention activities in a year's period is estimated to be equal to the time of three full-time employees. The department's home accident prevention committee feels, however, that three full-time persons could not possibly give the wide coverage offered by the entire field staff, or receive the same acceptance in the homes.

The department's home accident prevention program is still largely in the developmental stage, but it represents a serious approach to the problem. In the future, accident prevention activities will have an increasingly prominent place in the plans and objectives of the department.

Physician Visits During Summer of 1957

The American people visited their physicians during the months of July, August, and September 1957 at a rate of almost five times a year, according to data gathered through household interviews by the U. S. National Health Survey, Public Health Service.

The Survey report, entitled "Preliminary Report on Volume of Physician Visits, United States, July-September 1957" (see announcement on p. 568), points out that although the interviews occurred at a time of the year when people are least likely to call the doctor, respiratory diseases were probably at above-average levels.

Persons living on farms used physicians' services at a rate of 3.6 visits a year, compared with 4.5 for the rural nonfarm population and 5.1 for the urban population. Nine out of ten of the visits were in the physicians' offices.

Mass Therapy in Attempted Control of Amebiasis in a Mental Institution

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DEMONSTRATION of 25 laboratory proved cases of clinical amebiasis in an Iowa State institution for the feeble-minded initiated a cooperative control program. An epidemiological investigation, including examination of stool specimens, revealed that 64 percent of the males and 34.4 percent of the females in two buildings occupied by the more retarded patients were infected with *Entamoeba histolytica*. Experience with clinical cases had shown that the problem was not limited to any one building or area of the institution and, because of the poor personal hygiene of many of the patients, it was not believed that recommended methods of improving sanitation would stop the transmission of intestinal pathogens. It was therefore decided to attempt to control the situation through mass therapy of all the institution's residents.

The Institution

The institution, a hospital and school, is situated on 1,000 acres of land 40 miles north of Des Moines, Iowa. It has dormitories for patients, school buildings, a home for employees, and an administration building with separate hospital wards for men and women and dental, X-ray, and modern medical laboratories. Auxiliary buildings house the power plant, water filtration system, dairy, and farm equipment. Patients reside in sturdily constructed 2- or 3-story brick dormitories, which are well separated on beauti-

fully landscaped grounds. Inside, the buildings are well kept, despite overcrowding at times. Each dormitory has its own kitchen, operated by an employed cook and supervised by the dietitian. Most buildings have a dining room on each floor.

In 1951-53, the period of the study, there were approximately 1,600 feeble-minded and epileptic patients in the institution, ranging in age from 1 month to 80 years. Men and women patients were approximately equal in number. The 262 employees included 22 professional individuals, among them 9 physicians, 6 registered nurses, and a dietitian, and 105 supervisors or attendants in the dormitory buildings. Patients helped in such activities as serving food, washing dishes, feeding bedridden patients, cleaning floors, and changing beds.

Patients in a given dormitory were somewhat comparable mentally and physically. The pop-

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ulation composition of the eight dormitories was:

| Type of patient | Buildings | |
|-------------------------------------|---------------|-----------------|
| | Male patients | Female patients |
| Laundry, dairy, and garden workers. | Birches | Larches |
| School children----- | Hemlock | Westwood |
| Delinquent and low grade. | Oak Hall | Maple Lodge |
| Low grade----- | Pinehurst | Elm Crest |

Although the personal hygiene of patients in Birches and Larches Buildings was almost equal to that of normal individuals, the personal hygiene of those in Pinehurst and Elm Crest Buildings was very poor. Fecal incontinence was common with 67 percent of the males in Pinehurst and 49 percent of the females in Elm Crest. These patients soiled their beds and clothing with urine or feces, or both. Some were not averse to coprophagy. The personal hygiene of the patients in Oak Hall and Maple Lodge was not much better, but the hygiene of those in Hemlock and Westwood compared favorably with that of the patients in Birches and Larches. Larches was recognized as the "best building" in every respect.

A trial of mass therapy was planned in Pinehurst, the building with the known highest prevalence of *E. histolytica*. Oxytetracycline was selected for use in view of the report by Tobie and co-workers (1) of the virtual elimination of *E. histolytica* in a similar institution at Wassaie, N. Y., by mass therapy with this antibiotic. Two preliminary trials of mass therapy in Pinehurst Building, with 6-month followup, failed to confirm Tobie's work. Therefore, in extending mass therapy to the entire institution, it was decided to administer more than 1 drug at 6-month intervals on 2 occasions. Although the primary objective of the investigation was control of amebiasis, an effort was made to obtain information on the comparative effectiveness of the drugs employed.

Realizing that opportunities for reinfection probably varied from building to building, drugs were randomly assigned to the patients in 4 of the 8 buildings. These patients, constituting the principal study group, were examined to determine both the results of control measures and the relative effectiveness of the drugs. In the other four buildings, a single

drug was used to treat all patients in a building, and patients were examined to determine the degree of control obtained by mass therapy.

Drugs

Three standard amebicidal drugs were given, singly or in combination of two of the three (2, 3). These were oxytetracycline, carbarsone, iodochlorhydroxyquin, or oxytetracycline and carbarsone combined. The dosages were in accordance with the recommendations of Dr. Harry Most of New York University, Communicable Disease Center consultant.

The four therapeutic regimens were administered according to the weights of the patients (table 1). Two formulations of oxytetracycline were used. During the first treatment period in Pinehurst, the 250-mg. capsules were found to be too large for many of the younger patients to swallow, and it was sometimes necessary to mix the contents of the capsules with water. Therefore, oral drops of oxytetracycline were provided for the younger patients and others having difficulty in swallowing. The carbarsone and iodochlorhydroxyquin capsules were swallowed without difficulty. All medication was followed by a glass of water or fruit juice and by examination of the mouths of the patients to make certain that the drugs had been swallowed.

During preliminary trials of mass therapy in Pinehurst, one-half of the daily dosage was

Table 1. Dosages of four amebicidal drug regimens

| Drug | Weight of patients (pounds) | Dosage |
|-------------------------------------|-----------------------------|--|
| Oxytetracycline-- | >70 | 2 gm. per day for 10 days. |
| | <70 | 1 gm. per day for 10 days. |
| Oxytetracycline and carbarsone----- | >70 | 2 gm. oxytetracycline per day for 5 days. 1 gm. carbarsone per day for 10 days. |
| | <70 | 1 gm. oxytetracycline per day for 5 days. 0.5 gm. carbarsone per day for 10 days. |
| Carbarsone----- | >70 | 1 gm. per day for 10 days. |
| | <70 | 0.5 gm. per day for 10 days. |
| Iodochlorhydroxyquin----- | >70 | 1 gm. per day for 10 days. |
| | <70 | 0.5 gm. per day for 10 days. |

given in the morning and the other half in the afternoon. During mass therapy of the entire institution, the daily dosages had to be administered at one time, usually in the morning. A record clerk was always present to record the amount of medication received. Although a physician or a registered nurse was also present, supervisors and attendants often administered the drugs since they knew the idiosyncrasies of the patients and were best able to gain their cooperation.

Before instituting mass therapy in a building, the physician in charge checked the medication for each patient and made any necessary changes. Usually, recommended dosages (table 1) were given the older patients and those in good physical condition, but for very young or debilitated patients, dosages were reduced according to body weight.

When more than one drug was given, the physician changed the randomly assigned drug for persons for whom he considered its use contraindicated. At least once a day during the treatment period, the records of each patient were examined and he was seen by the attending physician. If intolerance to the medication was observed, therapy was changed or withdrawn. However, this was done for less than 3 percent of the patients, none of whom had been selected for examination.

Employees were encouraged to participate in the amebiasis control program by taking one of the medications. If they preferred, they could submit three specimens to the hospital laboratory for examination and, if the specimen was found to be positive for *E. histolytica*, they could be treated by their private physicians.

Collecting and Examining Specimens

Identical methods of collecting and examining fecal specimens were used throughout the study. In order to insure correct identification, specimens were collected in the presence of the ward supervisor or attendant and were brought immediately to a technician stationed in the building. The technician knew the building from which the specimens originated but did not know the drug regimen received. One portion of each specimen was preserved in 5

percent formalin and another in PVA fixative (4), and both portions were forwarded to the parasitology laboratories of the Communicable Disease Center, Chamblee, Ga.

The portions of feces preserved in formalin were concentrated by the formalin-ether sedimentation technique (5). Heidenhain iron-hematoxylin-stained films were prepared from the portions of feces preserved in PVA fixative and were examined with 50 \times and 95 \times oil immersion objectives. Unstained and iodine-stained wet mounts prepared from the concentrate sediments and Heidenhain iron-hematoxylin-stained films were examined for a minimum of 15 minutes each.

Preliminary Trials

Because of the results of Tobie's study (1), it was planned to evaluate the effectiveness of mass therapy through observation of the patients in Pinehurst Building during a 12-month post-treatment period. However, since the infection in Pinehurst was returning to a high level at the end of 3 months, the patients were re-treated 6 months after the first medication. During the first course of therapy, the antibiotic was given in 250-mg. capsules; during the second course, in oral drops. On each occasion, all patients, supervisors, and attendants received a 10-day course of the drug, the dosage depending on the weight and general condition of the patient.

During the 6 months following therapy, new admissions to Pinehurst were kept at a minimum. Any persons who had to be placed in the building were started on a 10-day course of medication 3 days before they were admitted. Also, during this period, the physician in charge was asked to withhold amebicidal drugs from all persons except those with active clinical amebiasis.

In order to evaluate the effectiveness of mass therapy, 125 patients were randomly selected for examination prior to therapy and again 1 month, 3 months, and 6 months after therapy was started. At each examination only 1 specimen was collected from each patient.

Of these 125 patients, 101 submitted specimens at each collection period during the 12 months of the two therapeutic trials. Intesti-

nal parasites were found in 93 of 101 patients, as follows:

| | |
|---|----|
| <i>Entamoeba histolytica</i> | 64 |
| <i>Entamoeba coli</i> | 75 |
| <i>Endolimax nana</i> | 63 |
| <i>Iodamoeba buetschlii</i> | 26 |
| <i>Dientamoeba fragilis</i> | 3 |
| <i>Giardia lamblia</i> | 11 |
| <i>Chilomastix mesnili</i> | 19 |
| <i>E. histolytica, E. coli, or E. nana</i> ¹ | 90 |

¹ Amebic prevalence rate (6).

For possible future comparison with other studies, there are included in the preceding tabulation and in table 3 figures for amebic prevalence (6). In determining this prevalence rate, a person infected with *E. histolytica*, *Entamoeba coli*, or *Endolimax nana* is counted as a single positive individual. Figure 1 shows the individual prevalence rates of these parasites at each examination.

Prior to the first mass therapy with oxytetracycline capsules, 64 percent of the patients in Pinehurst were positive for *E. histolytica*; 1 month after the beginning of therapy, 4 percent were positive; 3 months after, 18 percent; and 6 months after, 33 percent.

The week following the 6-month collection of specimens, the second mass therapy with oxytetracycline (oral drops) was administered. One month later, the prevalence of *E. histolytica* was reduced to 5 percent but, again, by the end of the 6-month post-treatment period, the rate had risen to approximately one-half of the pretreatment prevalence rate, or 19 percent. The graphs for the prevalence rates of *E. coli* and *E. nana* are similar to that for *E. histolytica*. However, by the end of only 3 months after each medication, the prevalence rates for these two amebae had almost regained the pretreatment levels.

Mass therapy with oxytetracycline had a marked effect upon *Iodamoeba buetschlii*, but apparently none on *Chilomastix mesnili* and *Giardia lamblia*. Prior to the first course of therapy, 26 of the 101 patients who submitted specimens were infected with *I. buetschlii*; 1 month and 3 months after treatment with oxytetracycline, 2 infections were found but none was observed at the next 4 examinations (9 months). The infections with *Dientamoeba fragilis* were too few for consideration.

Table 2. Results of mass therapy with oxytetracycline in Pinehurst Building

| Organism | Response in known positives | | |
|----------------------------------|---|---------------------------------|----------------|
| | Number positive pretreatment ¹ | Percent negative post-treatment | |
| | | 1 month later | 6 months later |
| <i>Entamoeba histolytica</i> --- | 97 | 94.8 | 70.1 |
| <i>Entamoeba coli</i> ----- | 151 | 63.6 | 15.9 |
| <i>Endolimax nana</i> ----- | 130 | 49.2 | 26.9 |

¹ Sum of positives prior to first and second preliminary trials of mass therapy.

Table 2 presents the observed effectiveness of mass therapy in individuals known to be positive for *E. histolytica* prior to two courses of therapy. Of the 97 patients known to be infected, 94.8 percent were "negative" 1 month later, and 70.1 percent were "negative" 6 months later. The effectiveness of therapy on *E. coli* and *E. nana* was significantly poorer, particularly at the end of 6 months.

Mass Therapy

In extending mass therapy to the entire institution, the 4 drug regimens were administered on 2 occasions 6 months apart. The second time, each patient received a different drug regimen from that he had received previously. The preliminary trials in Pinehurst had indicated that the effectiveness of mass therapy in controlling amebiasis might be determined by examining specimens collected 6 months after therapy. Therefore, specimens were examined the week prior to the first therapy, 6 months after the first therapy and just prior to the second therapy, and 6 months after the second therapy. At each examination, a single specimen was collected from as many as possible of the individuals who had been selected for examination.

Table 3 records the intestinal parasites found in the randomly selected patients in the eight dormitory buildings prior to mass therapy throughout the institution. The prevalence rate for *E. histolytica* ranged from 7 percent in Larches to 46 percent in Oak Hall. At the time

of this examination, Pinehurst residents had already received two courses of therapy. The initial rate for this parasite in Pinehurst had been approximately 64 percent (fig. 1).

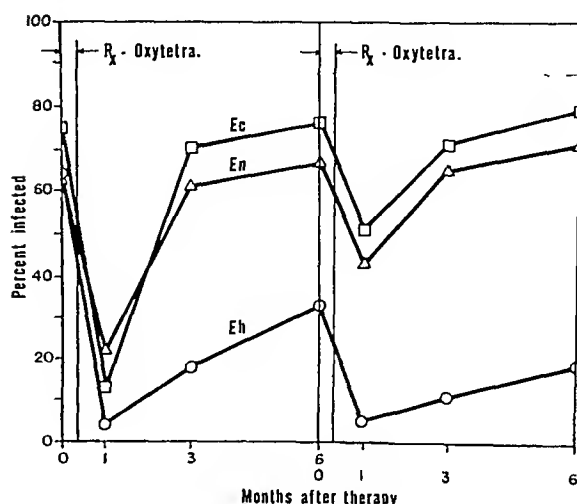
During the 12 months following the first course of therapy in the entire institution, all new admissions received the combination therapy of oxytetracycline and carbarsone for 3 days preceding admission to a dormitory.

Although control of amebiasis was the primary objective of the study, an attempt was made to obtain information on the relative effectiveness of the four drug regimens. Preliminary surveys had demonstrated that the prevalence of intestinal amebae varied from building to building in almost direct relationship to the general level of personal hygiene of the patients. Therefore, the dormitories were divided into 2 groups of 4 multiple-therapy buildings and 4 single-therapy buildings.

Multiple-Therapy Buildings

Because the general type of patients varied from building to building, the influence of reinfection on drug evaluation was equalized by randomly assigning all 4 therapeutic regimens to the patients in 4 of the 8 buildings. Birches,

Figure 1. Results of two preliminary trials of mass therapy with oxytetracycline in one building of a mental institution. Incidence of *Entamoeba histolytica*, *Entamoeba coli*, and *Endolimax nana* prior to medication and during the 6-month post-treatment period.



Hemlock, Larches, and Westwood dormitories, which housed the higher grade patients, were selected since it was thought that reinfection would be reduced to a minimum in these buildings. Each time mass therapy was given, all

Table 3. Prevalence of intestinal parasites in a mental institution prior to mass therapy, by building

| Observations | Four drug regimens | | | | Single drug regimen | | | | Total |
|--|--------------------|--------------------|----------------|----------------|----------------------|--------------------|-----------------|-------------------------------|-------|
| | Larches (female) | West-wood (female) | Hemlock (male) | Birches (male) | Maple Lodge (female) | Elm Crest (female) | Oak Hall (male) | Pinehurst ¹ (male) | |
| Number patients..... | 187 | 267 | 168 | 247 | 159 | 179 | 202 | 207 | 1,616 |
| Number examined..... | 117 | 116 | 119 | 118 | 50 | 47 | 50 | 50 | 667 |
| Percent positive..... | 62.4 | 87.9 | 70.6 | 77.1 | 70.0 | 74.5 | 72.0 | 82.0 | 74.5 |
| Organisms identified | Percent | | | | | | | | |
| | | | | | | | | | |
| <i>Entamoeba histolytica</i> | 6.8 | 49.1 | 23.5 | 27.1 | 24.0 | 29.8 | 46.0 | ² 34.0 | 28.6 |
| <i>Entamoeba coli</i> | 47.0 | 54.3 | 45.4 | 54.2 | 50.0 | 40.4 | 52.0 | 78.0 | 51.7 |
| <i>Endolimax nana</i> | 12.0 | 44.8 | 36.1 | 32.2 | 32.0 | 46.8 | 18.0 | 46.0 | 32.5 |
| <i>Iodamoeba buetschlii</i> | 2.6 | 4.3 | 10.1 | 5.9 | 2.0 | 0.0 | 18.0 | 0.0 | 5.5 |
| <i>Dientamoeba fragilis</i> | 12.0 | 9.5 | 12.6 | 8.5 | 2.0 | 0.0 | 4.0 | 10.0 | 8.7 |
| <i>Giardia lamblia</i> | 0.0 | 19.2 | 14.3 | 11.0 | 6.0 | 8.5 | 2.0 | 18.0 | 10.3 |
| <i>Chilomastix mesnili</i> | 14.5 | 11.2 | 13.4 | 7.6 | 10.0 | 12.8 | 12.0 | 24.0 | 12.6 |
| <i>E. histolytica</i> , <i>E. coli</i> , <i>E. nana</i> ³ | 53.8 | 80.2 | 62.2 | 67.8 | 62.0 | 63.8 | 70.0 | 80.0 | 66.9 |

¹ Patients in Pinehurst had been treated twice previously.

² Rate preceding preliminary trials, 64 percent.

³ Amebic prevalence rate (6).

ual parasites were found in 93 of 101 patients, as follows:

| | |
|---|----|
| <i>Entamoeba histolytica</i> | 64 |
| <i>Entamoeba coli</i> | 75 |
| <i>Endolimax nana</i> | 63 |
| <i>Iodamoeba buetschlii</i> | 26 |
| <i>Dientamoeba fragilis</i> | 3 |
| <i>Giardia lamblia</i> | 11 |
| <i>Chilomastix mesnili</i> | 19 |
| <i>E. histolytica</i> , <i>E. coli</i> , or <i>E. nana</i> ¹ | 90 |

¹ Amebic prevalence rate (6).

For possible future comparison with other studies, there are included in the preceding tabulation and in table 3 figures for amebic prevalence (6). In determining this prevalence rate, a person infected with *E. histolytica*, *Entamoeba coli*, or *Endolimax nana* is counted as a single positive individual. Figure 1 shows the individual prevalence rates of these parasites at each examination.

Prior to the first mass therapy with oxytetracycline capsules, 64 percent of the patients in Pinehurst were positive for *E. histolytica*; 1 month after the beginning of therapy, 4 percent were positive; 3 months after, 18 percent; and 6 months after, 33 percent.

The week following the 6-month collection of specimens, the second mass therapy with oxytetracycline (oral drops) was administered. One month later, the prevalence of *E. histolytica* was reduced to 5 percent but, again, by the end of the 6-month post-treatment period, the rate had risen to approximately one-half of the pretreatment prevalence rate, or 19 percent. The graphs for the prevalence rates of *E. coli* and *E. nana* are similar to that for *E. histolytica*. However, by the end of only 3 months after each medication, the prevalence rates for these two amebae had almost regained the pretreatment levels.

Mass therapy with oxytetracycline had a marked effect upon *Iodamoeba buetschlii*, but apparently none on *Chilomastix mesnili* and *Giardia lamblia*. Prior to the first course of therapy, 26 of the 101 patients who submitted specimens were infected with *I. buetschlii*; 1 month and 3 months after treatment with oxytetracycline, 2 infections were found but none was observed at the next 4 examinations (9 months). The infections with *Dientamoeba fragilis* were too few for consideration.

Table 2. Results of mass therapy with oxytetracycline in Pinehurst Building

| Organism | Response in known positives | | |
|----------------------------------|---|---------------------------------|----------------|
| | Number positive pretreatment ¹ | Percent negative post-treatment | |
| | | 1 month later | 6 months later |
| <i>Entamoeba histolytica</i> --- | 97 | 94.8 | 70.1 |
| <i>Entamoeba coli</i> ----- | 151 | 63.6 | 15.9 |
| <i>Endolimax nana</i> ----- | 130 | 49.2 | 26.9 |

¹ Sum of positives prior to first and second preliminary trials of mass therapy.

Table 2 presents the observed effectiveness of mass therapy in individuals known to be positive for *E. histolytica* prior to two courses of therapy. Of the 97 patients known to be infected, 94.8 percent were "negative" 1 month later, and 70.1 percent were "negative" 6 months later. The effectiveness of therapy on *E. coli* and *E. nana* was significantly poorer, particularly at the end of 6 months.

Mass Therapy

In extending mass therapy to the entire institution, the 4 drug regimens were administered on 2 occasions 6 months apart. The second time, each patient received a different drug regimen from that he had received previously. The preliminary trials in Pinehurst had indicated that the effectiveness of mass therapy in controlling amebiasis might be determined by examining specimens collected 6 months after therapy. Therefore, specimens were examined the week prior to the first therapy, 6 months after the first therapy and just prior to the second therapy, and 6 months after the second therapy. At each examination, a single specimen was collected from as many as possible of the individuals who had been selected for examination.

Table 3 records the intestinal parasites found in the randomly selected patients in the eight dormitory buildings prior to mass therapy throughout the institution. The prevalence rate for *E. histolytica* ranged from 7 percent in Larches to 46 percent in Oak Hall. At the time

by earlier examination. These included all floors of Westwood and the upper floors of Hemlock and Birches. No specimens were collected from Larches. Hence, it is not possible to extend the graph in figure 2 to indicate the prevalence rates at the second 6-month post-treatment period.

The relative effectiveness of mass therapy in these buildings is demonstrated in table 4. Since there were no significant differences between the response to the first and second administrations of mass therapy, the results are combined. Therapy was significantly more effective in Larches and in Hemlock than in the other 2 buildings for practically all species except *I. buetschlii*, which was apparently eliminated in all 4 buildings. All known infections of *E. histolytica* in Larches were "negative" 6 months after the first therapy.

In table 5 are recorded the results of the individual drug regimens in reducing known infections regardless of location. In only one instance, oxytetracycline against *D. fragilis*, was one drug observed to be significantly more effective than the others. Mass therapy, regardless of the drugs administered, was more effective against certain species than against

others. For example, therapy was significantly better against *E. histolytica* (62.5 percent "negative"), than against *E. coli* (50.8 percent) and *E. nana* (48.8 percent), while all known infections of *I. buetschlii* were apparently eliminated by therapy. The results of therapy in the individual buildings are based on too small a sample for analysis.

Single Drug Regimens

A single drug regimen was administered to the patients in Maple Lodge, Elm Crest, Oak Hall, and Pinehurst Buildings on each of the two occasions of mass therapy. Figure 3 presents the prevalence rates of *E. histolytica*, *E. coli*, and *E. nana* in approximately 50 randomly selected patients in each building before and 6 months after each course of therapy. At the end of 12 months a significant reduction in the prevalence of *E. histolytica* was observed in Oak Hall and Elm Crest Buildings, with possible elimination of the parasite in Maple Lodge. An increase in prevalence apparently occurred in Pinehurst during the same period.

In Maple Lodge, prior to therapy with the combination of oxytetracycline and carbarsone, the prevalence rate of *E. histolytica* was 24 per-

Table 4. Results of two courses of mass therapy with four drug regimens randomly administered to all patients in Birches, Hemlock, Larches, and Westwood Buildings

| Organism | Response in known positives ¹ | | | | | | | |
|------------------------------------|--|---|--------------------------------|---|--------------------------------|---|--------------------------------|---|
| | Birches | | Hemlock | | Larches ² | | Westwood | |
| | Number positive, pre-treatment | Percent negative, post-treatment ³ | Number positive, pre-treatment | Percent negative, post-treatment ³ | Number positive, pre-treatment | Percent negative, post-treatment ³ | Number positive, pre-treatment | Percent negative, post-treatment ³ |
| Total protozoa..... | 237 | 54.0 | 217 | 69.1 | 108 | 79.6 | 405 | 48.9 |
| Amebae..... | 207 | 52.2 | 177 | 69.5 | 92 | 81.5 | 344 | 46.8 |
| <i>Entamoeba histolytica</i> | 45 | 73.3 | 29 | 93.1 | 7 | 100.0 | 95 | 45.3 |
| <i>Entamoeba coli</i> | 87 | 34.5 | 72 | 63.5 | 53 | 84.9 | 117 | 40.2 |
| <i>Endolimax nana</i> | 53 | 49.1 | 49 | 55.1 | 16 | 62.5 | 95 | 43.2 |
| <i>Iodamoeba buetschlii</i> | 7 | 100.0 | 12 | 100.0 | 2 | 100.0 | 6 | 100.0 |
| <i>Dientamoeba fragilis</i> | 15 | 80.0 | 15 | 80.0 | 14 | 78.6 | 31 | 77.4 |
| Flagellates..... | 30 | 66.7 | 40 | 67.5 | 16 | 68.8 | 61 | 60.7 |
| <i>Giardia lamblia</i> | 16 | 53.3 | 21 | 66.7 | 0 | ----- | 39 | 56.4 |
| <i>Chilomastix mesnili</i> | 14 | 78.6 | 19 | 68.4 | 16 | 68.8 | 22 | 68.2 |

¹ Sum of positives prior to first and second mass therapy.

² Therapy administered on only one occasion.

³ 6 months following treatment.

four drug regimens were employed in each building. For the second course of therapy, each patient received a different drug, according to the following schedule:

| First course | Second course |
|----------------------|---------------------|
| Oxytetracycline----- | Carbarsone |
| Oxytetracycline----- | Iodochlorhydroxy- |
| and carbarsone. | quin |
| Carbarsone----- | Oxytetracycline and |
| Iodochlorhy- | carbarsone |
| droxyquin. | Oxytetracycline |

To evaluate the control program within each building, approximately 30 individuals on each of the drug regimens were randomly selected for examination, or a total of approximately 120 persons on each regimen. In all, over one-half of the 869 individuals in the four buildings were selected.

Single-Therapy Buildings

In Elm Crest, Muple Lodge, Oak Hall, and Pinehurst Buildings, which housed the lower grade patients, a single drug regimen was administered at each of the two mass therapy periods. The drugs were changed in each building on the second occasion. To appraise the effectiveness of control of amebiasis, 50 individuals in each building, or approximately 200 of the 747 persons in the 4 buildings, were randomly selected to submit specimens during the 3 designated periods.

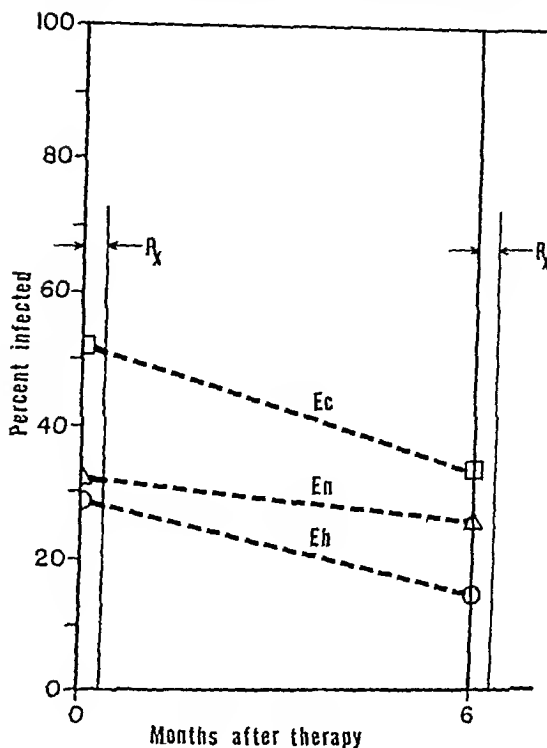
Results of Mass Therapy

The results of treatment with 4 drug regimens and with 1 drug regimen are given below.

Four Drug Regimens

Oxytetracycline, carbarsone, iodochlorhydroxyquin, and oxytetracycline and carbarsone combined were given to the patients in Larches, Westwood, Hemlock, and Birches Buildings on two occasions. Figure 2 shows the prevalence rates of *E. histolytica*, *E. coli*, and *E. nana* prior to the first course of therapy and 6 months later, based on the examination of 502 and 468 individuals, respectively. Dash lines are used in figures 2 and 3 since the lines do not indicate actual prevalence trends during the 6 months between examinations. From the experience in Pinehurst Building, it is reasonable

Figure 2. Results of mass therapy with four drug regimens in four buildings of a mental institution. Incidence of *Entamoeba histolytica*, *Entamoeba coli*, and *Endolimax nana* prior to medication and 6 months afterward.



to assume that an immediate decided drop in the prevalence of amebiasis after therapy was followed by a rise.

Prior to the first administration of the drugs, the average prevalence rate of *E. histolytica* in the four buildings was 28.8 percent (fig. 2). Six months later it was 14.4 percent. The prevalence of *E. coli* was also reduced significantly, but not the prevalence of *E. nana*. *I. buetschlii* was practically eliminated, being reduced from 5.7 percent to 0.5 percent; *G. lamblia* and *C. mesnili* were reduced slightly; and the rate for *D. fragilis* remained unchanged. Six months after therapy no infections of *E. histolytica* were found in the patients examined from Larches and the lower floors of Hemlock and Birches Buildings.

After the 6-month post-treatment examination, all patients were re-treated with another drug regimen. Six months later, because of pressure of other work, stool specimens were collected only from the problem areas revealed

Table 5. Results of mass therapy with four drug regimens randomly administered to all patients in Birches, Hemlock, Larches, and Westwood Buildings

| Organism | Response to drug regimen in known positives ¹ | | | | | | | | | |
|------------------------------------|--|---|--------------------------------|---|--------------------------------|---|--------------------------------|---|--------------------------------|---|
| | Oxytetracycline | | Oxytetracycline and carbarsone | | Carbarsone | | Iodochlorhydroxyquin | | Total | |
| | Number positive, pre-treatment | Percent negative, post-treatment ² | Number positive, pre-treatment | Percent negative, post-treatment ² | Number positive, pre-treatment | Percent negative, post-treatment ² | Number positive, pre-treatment | Percent negative, post-treatment ² | Number positive, pre-treatment | Percent negative, post-treatment ² |
| Total protozoa..... | 237 | 54.0 | 239 | 62.3 | 258 | 63.2 | 233 | 52.4 | 967 | 58.1 |
| Amebae..... | 207 | 53.1 | 199 | 61.8 | 213 | 60.0 | 201 | 52.7 | 820 | 57.0 |
| <i>Entamoeba histolytica</i> | 44 | 59.1 | 44 | 65.9 | 51 | 60.8 | 37 | 64.9 | 176 | 62.5 |
| <i>Entamoeba coli</i> | 74 | 40.5 | 80 | 56.3 | 89 | 55.1 | 86 | 50.0 | 329 | 50.8 |
| <i>Endolimax nana</i> | 62 | 45.2 | 50 | 56.0 | 46 | 58.7 | 55 | 38.2 | 213 | 48.8 |
| <i>Iodamoeba buetschlii</i> | 7 | 100.0 | 6 | 100.0 | 8 | 100.0 | 6 | 100.0 | 27 | 100.0 |
| <i>Dientamoeba fragilis</i> | 20 | 95.0 | 19 | 78.9 | 19 | 68.4 | 17 | 70.6 | 75 | 78.6 |
| Flagellates..... | 30 | 60.0 | 40 | 65.0 | 45 | 77.7 | 32 | 50.0 | 147 | 64.6 |
| <i>Giardia lamblia</i> | 14 | 50.0 | 19 | 63.2 | 25 | 72.0 | 18 | 44.4 | 76 | 59.2 |
| <i>Chilomastix mesnili</i> | 16 | 68.8 | 21 | 66.7 | 20 | 85.0 | 14 | 57.1 | 71 | 70.4 |

¹ Sum of positives prior to first and second therapy.

² 6 months following treatment.

practically unchanged 6 months after the second.

In Pinehurst Building, prior to therapy with carbarsone, the prevalence rate of *E. histolytica* was 34 percent; 6 months later, before therapy with the combination of oxytetracycline and carbarsone, it was 41.1 percent. Six months after the second therapy, the prevalence rate was 46.3 percent. Mass therapy with either drug regimen appeared to have little or no effect on the prevalence of *E. nana* and *E. coli*.

Since the patients in the four buildings did not receive the same medication, the relative effectiveness of mass therapy cannot be compared according to the response in known positives as was done in the case of the buildings where identical medication with four drug regimens was given (table 4). Likewise, since the type of patients varied from building to building, it is not practical to compare the effectiveness of the individual drug regimens as was done in the other buildings (table 5).

Treatment of Employees

All save 18 of the 262 employees in the institution received amebicidal drugs during the

mass therapy program. The 105 employees working in the 8 dormitories generally received their medication along with the patients. Most of the 18 untreated individuals were in administrative or professional positions. Two *E. histolytica* positive employees in Elm Crest refused therapy. Prior to the mass therapy program the examination of a single stool specimen each from 128 employees revealed 3.9 percent positives for *E. histolytica*.

Toxicity of Drugs

Since only standard amebicides of known toxicity were used in this study, physicians and nurses were primarily concerned only with those side reactions which might endanger the patients or interfere with proper administration of the medication. Aversion to the oral drops of oxytetracycline was the most troublesome side reaction. Although the younger children liked the sweet, cherry flavor of the oral drops, a number of the older patients, particularly the teen-age girls, vomited immediately after the drug was administered. When the drug was given in capsules, the difficulty ended.

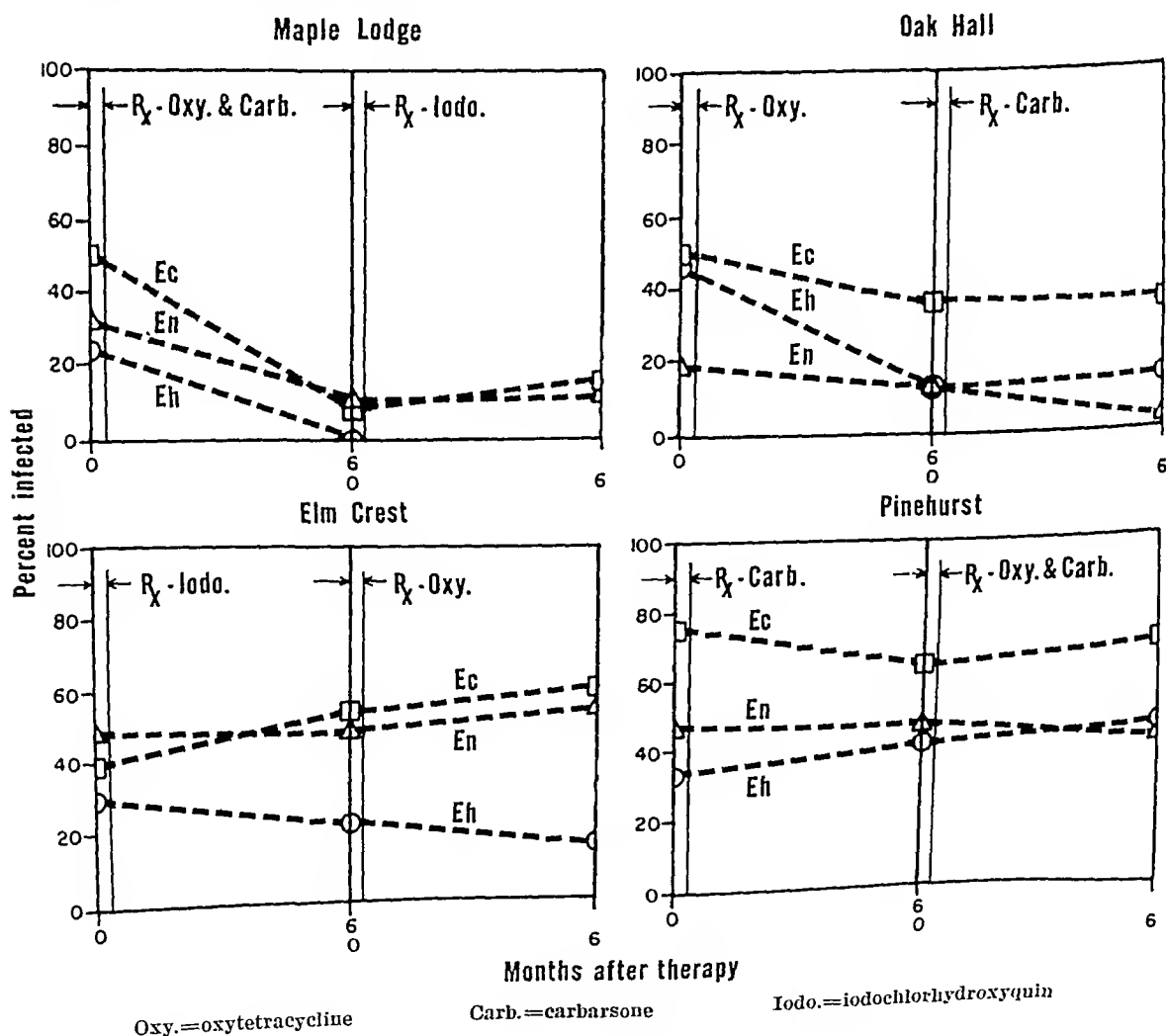
cent. Six months later, just before mass therapy with iodochlorhydroxyquin, it was zero. No *E. histolytica* infections were found 6 months after the second course of therapy but the prevalence rates of *E. coli* and *E. nana* were slightly higher than the reduced rates which were found 6 months after the first course of treatment.

In Oak Hall, prior to therapy with oxytetracycline, the prevalence rate of *E. histolytica* was 46 percent. Six months later, immediately preceding therapy with carbarsone, it was 12 percent, and 6 months after the second course it

was slightly higher. The responses of *E. coli* and *E. nana* were similar, although *E. nana* seemed to be affected more by carbarsone than were the other parasites.

In Elm Crest Building, prior to therapy with iodochlorhydroxyquin, the prevalence rate of *E. histolytica* was 29.8 percent; 6 months later, just before therapy with oxytetracycline, it was 22 percent; and 6 months after the second course of treatment the rate was 16.7 percent. The prevalence of *E. nana* was practically the same at each examination while that of *E. coli* was higher 6 months after the first therapy and

Figure 3. Results of mass therapy with single drug regimens in four separate buildings of a mental institution. Incidence of *Entamoeba histolytica*, *Entamoeba coli*, and *Endolimax nana* prior to medication on two occasions and 6 months afterward.



histolytica than against *E. coli* or *E. nana*. This selective action of amebicides in man, particularly the ease of eliminating infections of *I. buetschlii*, has been observed by others (1, 8).

The fact that no significant differences were observed in the activity of the four regimens against *E. histolytica* does not, of course, mean that none existed. The four drugs were randomly assigned to patients in four buildings since it was realized at the outset that differences in opportunity for reinfection would make it difficult to compare groups of patients receiving different medications. By randomization, reinfection opportunities were made more nearly equal. The results suggest that reinfections occurred frequently in most of the buildings so that even if certain drugs were significantly more effective than others, the differences may have been masked by the time post-treatment examinations were made. If the investigation had been directed specifically toward drug evaluation rather than toward control, more frequent post-treatment examinations would have been made. This would have required additional technical help, which was not available.

Some differences in drug activity are suggested by the results obtained in the buildings on single therapies. For example, oxytetracycline alone or combined with carbarsone appeared somewhat more effective than the other drugs (fig. 3). Although the superiority of this combination was observed in the treatment of acute amebiasis in Korea (3), caution must be exercised in drawing conclusions from results in the single therapy buildings since the patients were not similar in each building, and in some instances the drugs were given at different times of the year.

Although other workers have reported on mass therapy of patients in selected buildings of mental institutions (1, 9, 10), to our knowledge, this investigation constitutes the first attempt to control amebiasis in an entire institution by mass therapy. Although only limited success was obtained, the authors still believe that mass therapy constitutes the only practical approach to control in mental institutions with amebiasis problems.

Theoretically, the administration of a 100

percent effective drug, combined with a thorough cleanup campaign, would solve the problem. Lacking these two, perhaps idealistic, conditions, the administration of less effective drugs at intervals more frequent than 6 months may accomplish the elimination of *E. histolytica* in such relatively confined populations as exist in mental institutions. Berberian and co-workers (9) found that, after mass therapy with bismuth glycolylarsanilate and chloroquine phosphate, weekly administration of the same combined therapy to one part of the initial population reduced the infection rate of *E. histolytica* to 25 percent and daily administration to another group reduced the rate to 10 percent of the pretreatment levels. Although these results are encouraging, the intervals between treatments are too frequent for practical application in most institutions.

Summary

In an institution of approximately 1,600 mentally deficient patients living in 8 separate buildings, examination of single stool specimens from 667 individuals indicated that at least 29 percent harbored *Entamoeba histolytica*. Prevalence rates ranged from 7 to 64 percent from building to building.

Preliminary tests of mass therapy in the building with the highest prevalence of *E. histolytica* showed that single courses of oxytetracycline did not eradicate all infections and that the incidence of infection rose to one-half of the pretreatment level by the end of 6 months.

When mass therapy was extended to the entire institution, each patient was given 1 of 4 drug regimens—carbarsone, iodochlorhydroxyquin, oxytetracycline, and a combination of oxytetracycline and carbarsone—on 2 occasions 6 months apart. On the second occasion, the drug was changed for each person. Results of examinations performed 6 months after each medication indicated that mass therapy was successful in reducing the prevalence of *E. histolytica* in 7 of the 8 buildings but that the species apparently was "eliminated" in only 3 buildings. The effectiveness of therapy appeared to be related to the prevalence rate of *E. histolytica* in each building prior to medication and to the general level of personal hygiene of the patients.

No serious cases of diarrhea, more than four bowel movements a day, developed either during or within a few days after medication. Also, no cases of pruritus were brought to the attention of the physicians and nurses; however, the patients in the institution are relatively insensitive to such conditions or else accept them as a matter of course.

A few minor rashes were observed in patients receiving oxytetracycline and carbarsone combined but the attending physicians questioned any connection between the rashes and the drugs. One serious rash developed in a patient receiving iodochlorhydroxyquin. Dizziness was reported by one individual on carbarsone.

Discussion

In 1951 Tobie and his co-workers (1) reported virtual elimination of *E. histolytica* infections from a building of Wassaic State School, an institution for mental defectives, by treating all patients with oxytetracycline. Therefore, in our study it was surprising to observe the prevalence rate of *E. histolytica* return to relatively high levels after the use of the same antibiotic in two preliminary trials of mass therapy in Pinehurst Building. In both institutions, a similar course of therapy was used and no new patients were admitted to the buildings during the post-treatment periods without first undergoing therapy.

One striking difference between the two studies which may have contributed to the diverse results was the pretreatment prevalence rates of *E. histolytica*. In Pinehurst Building, one stool examination revealed *E. histolytica* infections in 64 percent of the patients, while at Wassaic four stool examinations showed a prevalence rate of 49 percent. Since more examinations of the Pinehurst patients would undoubtedly have increased the percentage of positives, there was a decided difference in the prevalence rates of *E. histolytica* in the two populations. Inability to eradicate all infections apparently allowed a significant reservoir to remain to reinfect patients through poor personal hygiene.

When mass therapy was administered throughout the entire institution on two occa-

sions, at 6-month intervals, the prevalence rates of *E. histolytica* were significantly lower in 7 of the 8 buildings by the end of the year's study. The effectiveness of therapy varied from building to building and appeared to be related to the prevalence of *E. histolytica* and to the general type of patients residing in the buildings. At the post-treatment examinations, *E. histolytica* was no longer found in residents of the three buildings with the lowest pretreatment prevalence rates (Larches, Hemlock, and Maple Lodge). Two of these buildings were occupied by the higher type of patients. Little or no change was noted in Pinehurst Building, which had the highest prevalence of *E. histolytica* and the most retarded patients.

Although stool examinations were not performed until 6 months after the end of mass therapy of the entire institution, from results observed in preliminary trials in Pinehurst, it is probable that a number of *E. histolytica* infections remained in each building after therapy was completed. In view of the patients' poor personal hygiene the treatment failures probably served as sources of infection. In Elm Crest, two infected employees, one of whom was a cook, may have been another source of infection.

In addition to the human reservoirs, reinfection may have occurred from organisms in the environment. In the first trials in Pinehurst the prevalence of *E. coli* returned to a high level after therapy more rapidly than did the prevalence of *E. histolytica* (fig. 1). Since both organisms were at a low level 2 weeks after therapy, the more rapid rise in prevalence of *E. coli* may indicate that cysts of *E. coli* remained viable in the environment for longer periods than did cysts of *E. histolytica*. Laboratory experimentations (2) have shown that cysts of *E. coli* survive desiccation to a much greater degree than do cysts of *E. histolytica*.

In comparing results of the four drug regimens in the four buildings on parallel therapy, the only observed difference in drug activity was against *D. fragilis*. Oxytetracycline was significantly more effective than any of the other medications in reducing the prevalence of this parasite. All of the regimens apparently eliminated the few known infections of *I. buetschlii* and were more effective against *E.*

Neonatal Response to DTP Vaccines

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IMMUNIZATION and vaccination during the first, second, or third month of life has been advocated by health authorities to provide protection during the period of greatest vulnerability to infection (1-4). As infants are susceptible to pertussis from birth, and fatality is highest during the first 6 months of life, delay in pertussis immunization until 3 to 6 months of age fails to prevent most of the deaths from this disease. In addition, the advent of routine poliomyelitis vaccination requires establishing optimum immunization schedules for diseases for which specific prevention is now available. General concern over the ability of the infant to respond during the first month of life to a variety of antigens, singly or in combination, has deterred early immunization procedures. The tendency to delay immunization has also resulted from unwillingness to expose the newborn to local and systemic reactions that may accompany injection.

Antigens that will stimulate maximum protection in the newborn with a minimum of side reactions are diligently sought. The choice of antigen is complicated by the variation in potency of available preparations (5). Our study measures response to combined immunization initiated within the first 2 weeks of life, compares the response to aluminum phosphate and

aluminum hydroxide adsorbed antigens, and observes local and systemic reactions following the use of each of these preparations.

Method of Study

A group of 112 maternity cases in the seventh and eighth month of pregnancy was selected for study from prenatal clinics of the Los Angeles City Health Department. These patients were selected on the basis of their willingness to cooperate, freedom from disease, stabilized marriage, and stable residence pattern.

Patients in the study were delivered at the Los Angeles County General Hospital. At term or at delivery a 10-ml. sample of blood was collected from the mother. Cord blood specimens were also requested. These specimens were followed by 5-ml. specimens of whole blood collected from the infants at intervals of approximately 1 month, 6 months, and 1 year following completion of diphtheria-tetanus toxoid and pertussis vaccine (DTP) inoculations. The Los Angeles City Health Department laboratory obtained agglutination titers and performed antibody titrations.

Pertussis agglutination titers, based upon the ability of the patient's serum to agglutinate a standard number of *Haemophilus pertussis* organisms, were obtained according to standard methods (6), except that the organisms were incubated overnight at 37° C. and not at room temperature. The titer represents the highest serum dilution showing a 2-plus reaction.

Diphtheria antitoxin titration was performed according to a modification of the method of Frobisher (7). The titration was based on the standardization of a diphtheria toxin, the end reaction in the presence of a known amount of

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No significant differences were observed in the relative effectiveness of the four drug regimens against *E. histolytica*. However, since the study was primarily concerned with control of infections and was not specifically designed for the evaluation of drugs, this result cannot be taken as conclusive.

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SUPPLY REFERENCE

Charles Pfizer and Co., Brooklyn, N. Y., Eli Lilly and Co., Indianapolis, Ind., and Ciba Pharmaceutical Products, Summit, N. J., provided the drugs used in the tests.

Conference on Nurse Traineeship Program

A national conference to evaluate the professional nurse traineeship program of the Public Health Service (title II, P. L. 84-911) will be held in Washington August 13-15, 1958. The program provides financial aid to graduate nurses preparing for teaching, supervisory, or administrative positions in nursing. Since its inception in 1956, the program has awarded 1,387 traineeships through 60 schools of nursing and public health. Funds allocated by Congress total \$5 million.

About 80 recognized authorities from the fields of nursing education, medicine, hospital and public health nursing service, hospital administration, education, and public health administration will participate in the conference. They will determine the adequacy of the traineeship program in meeting the need for administrators and teachers of nursing and make recommendations as to possible modifications in the program.

Dr. John Millett, previously on the President's Committee on Administrative Management, the Social Science Research Council, and the National Resources Planning Board, and currently president of Miami University, Oxford, Ohio, will serve as chairman of the conference.

Figure 1. Pertussis agglutination titers, maternal and cord blood

| Maternal Prenatal Blood | 1:1,280 | | | | | | | | |
|-------------------------|---------|------|------|------|------|-------|-------|-------|---------|
| | 1:640 | | | | | | | | |
| | 1:320 | 1 | | | | | | | |
| | 1:160 | | | | 1 | | 1 | | |
| | 1:80 | 1 | 2 | 1 | | | | | |
| | 1:40 | 6 | 2 | 3 | 1 | | | | |
| | 1:20 | 5 | 1 | 6 | 1 | | | | |
| | 1:10 | 4 | | | | | | | |
| | <1:10 | 4 | 1 | 1 | | | | | |
| | | | | | | | | | |
| Umbilical Cord Blood | | | | | | | | | |
| | <1:10 | 1:10 | 1:20 | 1:40 | 1:80 | 1:160 | 1:320 | 1:640 | 1:1,280 |

is shown in table 1. Of the 93 mothers with infants in the study, 61 (65.6 percent) had titers of 1:10 or less. Only 5 had titers greater than 1:80. Cord blood specimens were submitted for testing following 42 deliveries. The quantitative distribution of maternal prenatal and the corresponding cord blood pertussis agglutination titers is shown in figure 1. Higher titers were observed in the corresponding maternal specimens. Titers of 1:10 or less were obtained in 10 of the maternal and in 25 of the cord blood specimens.

The agglutination titers at the time of the first postvaccination bleeding (1 month following third DTP injection), according to the antigen used, are shown in table 2. Higher agglutination levels were observed among the 41 infants who received the aluminum phosphate

adsorbed antigen. The median titer among infants receiving the aluminum phosphate antigen was 1:80 as compared with a median titer of 1:10 among 37 infants receiving the aluminum hydroxide adsorbed antigen.

One month postvaccination titers were determined in 30 of the infants for whom the agglutination level of cord blood was observed at birth (fig. 2). Fifteen of these infants received aluminum phosphate and 15 aluminum hydroxide adsorbed antigen. A comparison of specimens tested 1 month after completion of vaccination with the cord blood specimens shows that 11 infants who received aluminum phosphate and 2 who received aluminum hydroxide adsorbed antigen had an increase in the pertussis agglutination titer to 1:80 or greater.

The ability to maintain the agglutination

antitoxin producing a zone of erythema approximately 1 cm. in diameter in the skin of a guinea pig. A dilution of serum that gave the same reaction as the standard antitoxin to the same amount of toxin was recorded as the same amount of antitoxin as the standard. The response to tetanus toxoid was not determined in this study.

As soon as possible following discharge from the hospital, the infants received the first of three intramuscular (lateral gluteal) 0.5-ml. injections of commercially prepared DTP. Aluminum phosphate adsorbed antigens and aluminum hydroxide adsorbed antigens were used in alternate infants. Each 0.5 ml. dose contained the equivalent of 30 billion *H. pertussis* organisms. All of the initial injections were given within the first 14 days after birth except for one set of twins who were not available for immunization until the 19th day. The first injection was given in the home. The second and third doses were scheduled at intervals of 4 weeks. Followup home visits were made by public health nurses or by physicians to obtain case histories, to observe reactions, and to schedule clinic visits for subsequent injections and collection of specimens. One child health conference session was reserved weekly at the health center for the study cases. Every effort was made to adhere as closely as possible to the schedule for inoculations and collection of specimens. If the patient failed to appear at the clinic as scheduled, the injections were given and the blood specimens collected in the home within 10 days.

Classification of local reactions was based upon the degree of erythema and induration at the site of injection. Local reaction was recorded as mild, moderate, or severe according to the following definitions:

Mild: Erythema of less than 3 cm. in diameter and/or induration persisting for not more than 2 days, or small persistent nodule.

Moderate: Erythema of 3 cm. or more in diameter with induration persisting for more than 2 days.

Severe: Induration progressing to necrosis or accompanied by a wide area of erythema.

Systemic reactions were classified as:

Mild: Temperature not more than 100° F., restlessness, drowsiness, or irritability of less than 12 hours.

Moderate: Temperature up to 101° F., symptoms of illness persisting for 12 hours or more.

Severe: Temperature above 101° F., in the presence of symptoms and signs of illness.

Results

From the 112 pregnant women who entered the study, 93 newborn infants were available for followup. Of these, 78 completed the series of inoculations and submitted at least one postvaccination blood specimen. Second specimens were obtained from 72 infants and third specimens from 54. The median age at the time of collection of each of the 3 specimens was 3.2 months, 8.5 months, and 15 months.

Response to Pertussis Vaccine

The distribution of "prevaccination" titers (as reflected by maternal and cord blood specimens) and of postvaccination titers for infants

Table 1. Pertussis agglutination titers

| Titer | All mothers | Mothers of infants in study | Cord | Infant postvaccination | | |
|---------|-------------|-----------------------------|------|------------------------|----------|--------|
| | | | | 1 month | 6 months | 1 year |
| 1:1,280 | 0 | 0 | 0 | 1 | 0 | 1 |
| 1:640 | 0 | 0 | 0 | 5 | 1 | 2 |
| 1:320 | 0 | 0 | 1 | 3 | 9 | 2 |
| 1:160 | 6 | 5 | 0 | 14 | 9 | 8 |
| 1:80 | 6 | 5 | 2 | 11 | 12 | 10 |
| 1:40 | 8 | 7 | 3 | 7 | 4 | 4 |
| 1:20 | 17 | 15 | 12 | 7 | 10 | 7 |
| 1:10 | 22 | 18 | 6 | 5 | 6 | 5 |
| <1:10 | 53 | 43 | 19 | 25 | 21 | 15 |
| Total | 112 | 93 | 42 | 78 | 72 | 54 |

had a 1:80 titer and two had 1:10 titer or less 1 year later. Of the 23 infants injected with aluminum hydroxide who had titers less than 1:80 one month following vaccination, 5 had titers of 1:80 or more one year later. Observation of the serum agglutination titers 1 month and 1 year after vaccination indicates that once agglutinins are stimulated, the aluminum phosphate adsorbed antigen was the better of the two in maintaining the titer for 1 year.

Response to Diphtheria Toxoid

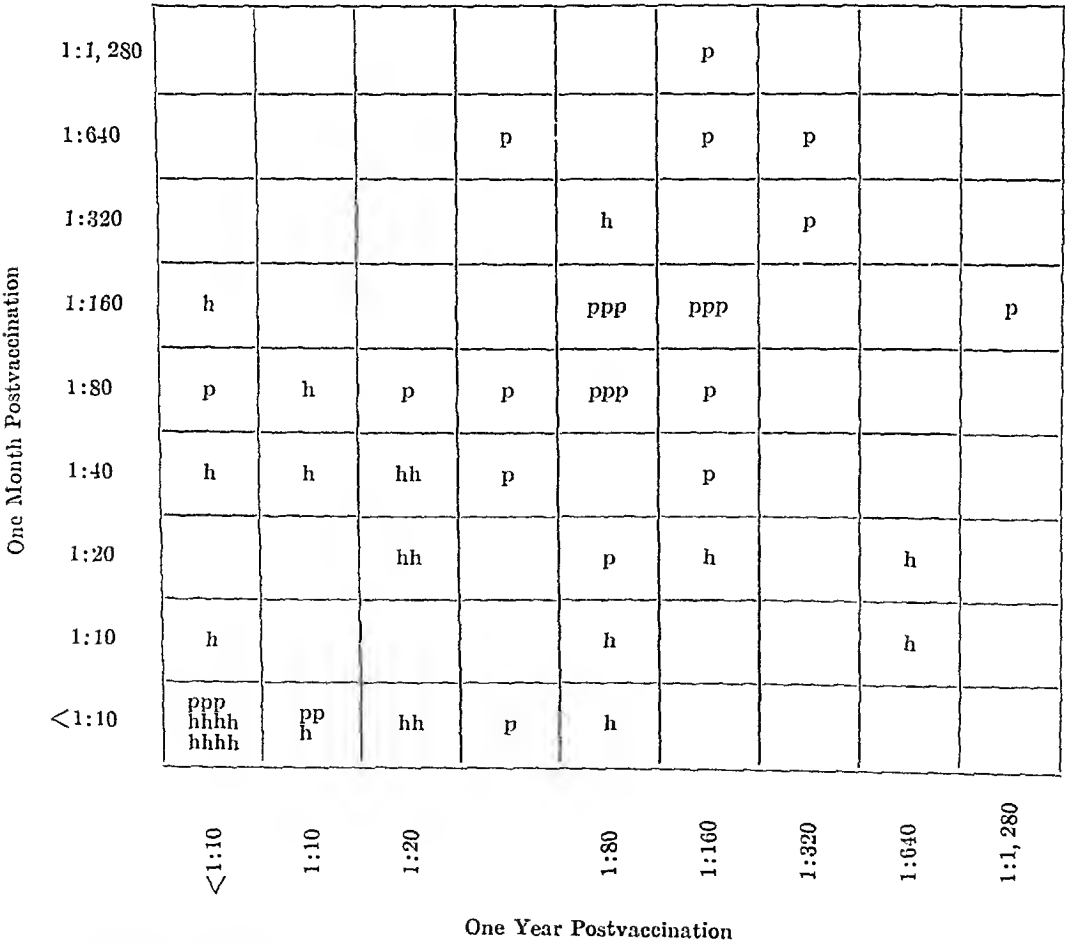
Closer agreement was observed between maternal and cord blood diphtheria antitoxin levels (fig. 4) than in pertussis agglutinins (fig. 1). In 9 of 42 cases there was no demonstrable diphtheria antitoxin (less than 0.01 units per

ml.) in maternal and cord blood. Both maternal and cord blood revealed 0.01 units per ml. in 7 cases, 0.1 unit in 12 cases, and 1.0 unit in 2 cases.

Among the 30 infants with a cord blood and 1 postinoculation specimen, 18 showed increases in antitoxin level by the first month after completion of the injections, 9 remained the same, and 3 had a lower level than was observed in the cord blood (fig. 5). The results according to antigen used are as follows:

| | Phosphate | Hydroxide | Total |
|---------------------|-----------|-----------|-------|
| Titer increase----- | 9 | 9 | 18 |
| Titer same----- | 4 | 5 | 9 |
| Titer decrease----- | 2 | 1 | 3 |
| Total----- | 15 | 15 | 30 |

Figure 3. Pertussis agglutination titers 1 month and 1 year following vaccination, by type of antigen



p=aluminum phosphate
h=aluminum hydroxide

titer is observed by comparing the titer at the third postvaccination bleeding (1 year after completion of vaccination) with the titers on first postvaccination bleeding (fig. 3). Among the 54 infants from whom 1-month and 1-year postvaccination blood specimens were obtained, 28 received the aluminum phosphate and 26 the aluminum hydroxide adsorbed antigen. Among those receiving aluminum phosphate adsorbed antigen 19 had titers of 1:80 or higher 1 month following vaccination. Of these, 15 had titers of 1:80 or more 1 year following vaccination. Among the infants receiving aluminum hydroxide who were successfully followed for 1 year, 3 had titers of 1:80 or more 1 month following vaccination. One of these

Table 2. Pertussis agglutination titers 1 month following vaccination, by type of antigen

| Titer ¹ | Aluminum phosphate | Aluminum hydroxide |
|--------------------|--------------------|--------------------|
| 1:1,280----- | 1 | 0 |
| 1:640----- | 5 | 0 |
| 1:320----- | 2 | 1 |
| 1:160----- | 12 | 2 |
| 1:80----- | 9 | 2 |
| 1:40----- | 2 | 5 |
| 1:20----- | 2 | 5 |
| 1:10----- | 0 | 5 |
| <1:10----- | 8 | 17 |
| Total----- | 41 | 37 |

¹ Median for aluminum phosphate is <1:80; aluminum hydroxide is >1:10.

Figure 2. Pertussis agglutination titers of cord blood and 1-month postvaccination blood specimens, by type of antigen

| | | | | | | | | |
|---------|----------|------|------|--------|------|-------|-------|---------|
| 1:1,280 | | | | | | | | |
| 1:640 | | | | | | | | |
| 1:320 | | | | | | | | |
| 1:160 | | | | | | | | |
| 1:80 | | | | | p | h | | |
| 1:40 | | | | | p | | | |
| 1:20 | p h | hh | h | p | p | | p | |
| 1:10 | h | | | h | | h | | |
| <1:10 | p hhh | hh | h | p h | ppp | ppp | p | |
| | <1:10 | 1:10 | 1:20 | 1:40 | 1:80 | 1:160 | 1:320 | 1:640 |
| | | | | | | | | 1:1,280 |

One Month Postvaccination

p=aluminum phosphate
h=aluminum hydroxide

Table 3. Pertussis agglutination and diphtheria antitoxin titration 1 month following completion of DTP inoculations, by type of antigen

| Pertussis titration | Diphtheria antitoxin units per ml. | | | | | | | | | |
|---------------------|------------------------------------|------|-----|-----|-------|--------------------|------|-----|-----|-------|
| | Aluminum phosphate | | | | | Aluminum hydroxide | | | | |
| | <0.01 | 0.01 | 0.1 | 1.0 | Total | <0.01 | 0.01 | 0.1 | 1.0 | Total |
| 1:1,280..... | | | | 1 | 1 | | | | | 0 |
| 1:640..... | | 1 | 1 | 3 | 5 | | | | | 0 |
| 1:320..... | | | 8 | 1 | 9 | | | | 1 | 1 |
| 1:160..... | | 1 | 6 | 5 | 12 | | | 2 | | 2 |
| 1:80..... | | | 4 | 5 | 9 | | 1 | 1 | | 2 |
| 1:40..... | | 1 | | 1 | 2 | | 2 | 2 | 1 | 5 |
| 1:20..... | | | 1 | 1 | 2 | | 2 | 2 | 1 | 5 |
| 1:10..... | | | | | 0 | | 2 | 2 | 2 | 6 |
| <1:10..... | | 3 | 5 | | 8 | | 7 | 8 | 4 | 19 |
| Total..... | 0 | 6 | 25 | 17 | 48 | 0 | 14 | 17 | 9 | 40 |

diphtheria protection, the following results are obtained.

| | PHOSPHATE | | HYDROXIDE | |
|--------------|-----------|---------|-----------|---------|
| | Number | Percent | Number | Percent |
| Failure..... | 23 | 48.0 | 37 | 92.5 |
| Success..... | 25 | 52.0 | 3 | 7.5 |
| Total..... | 48 | 100.0 | 40 | 100.0 |

Selecting a titer of 1:80 or more for pertussis and at least 0.01 AU/ml. for diphtheria as a criterion for protection, the differences in the percent of successes and failures for the two products are greater.

| | PHOSPHATE | | HYDROXIDE | |
|--------------|-----------|---------|-----------|---------|
| | Number | Percent | Number | Percent |
| Failure..... | 12 | 25.0 | 35 | 87.5 |
| Success..... | 36 | 75.0 | 5 | 12.5 |
| Total..... | 48 | 100.0 | 40 | 100.0 |

Differences in the antigens with respect to combined diphtheria and pertussis protection 1 year following the inoculations may be derived from table 4. Requiring agglutination at 1:160 dilution and 0.1 AU/ml. as a criterion, 35.5 percent of the infants receiving the aluminum phosphate and 11 percent of those receiving aluminum hydroxide were protected 1 year after the last inoculation. At the levels of 1:80 agglutination and 0.01 AU/ml., 58 percent of the infants injected with aluminum

phosphate antigen, and 22 percent injected with aluminum hydroxide were protected at 1 year.

Reactions Following Injections

Infants were observed for local and systemic reactions following 283 of the injections. Local reactions ranging from mild to severe were observed following 55 of the injections (19 percent). Systemic reactions ranging from mild to moderate, according to the criteria used, followed 33 injections (11 percent). Local reactions occurred among 33 (23 percent) of the 147 who received aluminum phosphate adsorbed antigen and among 22 (16.2 percent) of 136 receiving aluminum hydroxide adsorbed antigen injections. Of the 30 systemic reactions, 12 followed the aluminum hydroxide, and 18 the aluminum phosphate antigen. The differences observed are not statistically significant.

Discussion

The data indicate that of the two antigens used, the aluminum phosphate adsorbed product is superior in combined diphtheria and pertussis neonatal immunization. The possibility that factors other than antigenicity could have influenced the results must be considered. Although losses from the study impose important limitations, the losses were equally divided according to the antigen used. Of 21 infants

Figure 4. Diphtheria antitoxin units per milliliter, maternal and cord blood.

| | | | | | |
|----------------|-------|----------------------|------|-----|-----|
| Maternal Blood | 1.0 | | | 3 | 2 |
| | 0.1 | 2 | 1 | 12 | |
| | 0.01 | 3 | 7 | | |
| | <0.01 | 9 | 3 | | |
| | | <0.01 | 0.01 | 0.1 | 1.0 |
| | | Umbilical Cord Blood | | | |

Although higher titers were observed 1 month following inoculation in the group receiving the aluminum phosphate antigen, these infants also had higher titers in the preinoculation cord blood specimens (fig. 5). There were no differences in the antigens when response was based upon increase in titer.

Titration of diphtheria antitoxin 1 year after completion of the DTP injection can be compared with the levels observed at 1 month following the third injection in 54 infants from whom 1-month and 1-year postvaccination

Figure 5. Diphtheria antitoxin units per milliliter, cord blood and infant blood 1 month following immunization.

| | | | | | |
|----------------------|-------|---|--------|-------------|------------|
| Umbilical Cord Blood | 1.0 | | | p | |
| | 0.1 | | p h | pppp hhh | ppp |
| | 0.01 | | hh | p h | pp |
| | <0.01 | | h | hhhh | ppp hhh |
| | | <0.01 | 0.01 | 0.1 | 1.0 |
| | | Infant Blood 1 Month After Immunization | | | |

p=aluminum phosphate
h=aluminum hydroxide

specimens were obtained (fig. 6). Twenty-five of these infants had received the aluminum hydroxide and 29 the aluminum phosphate adsorbed antigen. Thirty infants maintained the same level of antitoxin units per ml., equally distributed between the two antigens. An increase at 1 year was noted in 17 of the 54 infants, including 6 of the 25 who had received aluminum hydroxide adsorbed antigen and 11 of the 29 receiving the aluminum phosphate antigen. The antitoxin level was lower at 1

Figure 6. Diphtheria antitoxin units per milliliter, 1 month and 1 year following immunization.

| | | | | | |
|----------------------------|-------|---------------------------|-----------------|---------------------------|--------------------|
| One Month Postimmunization | 1.0 | | | ppp h | pppp ppp hhh |
| | 0.1 | | hhh | ppp ppp hhh hhhh | pppp ppp h |
| | 0.01 | | pp hhh hh | pp hhh hh | pp |
| | <0.01 | | | | |
| | | <0.01 | 0.01 | 0.1 | 1.0 |
| | | One Year Postimmunization | | | |

p=aluminum phosphate
h=aluminum hydroxide

year in 7 of the infants, 4 of whom had received aluminum hydroxide antigen and 3 aluminum phosphate antigen. No differences were observed in the ability of the two antigens to maintain antitoxin levels of 1.0, 0.1, or 0.01 units per ml. at 1 year following completion of immunization.

Combined Protection

Table 3 presents the combined results of pertussis agglutination and diphtheria antitoxin titration 1 month after the third inoculation. These data may be observed at any agglutination and antitoxin level for pertussis and diphtheria. Selecting as a criterion a titer of 1:160 or more for pertussis protection and at least 0.1 antitoxin unit per ml. (AU/ml.) for

num hydroxide adsorbed preparation. Better combined protection against diphtheria and pertussis followed inoculation with the aluminum phosphate adsorbed antigens.

No differences in local or systemic reactions following the two types of antigens were observed.

The data confirm the desirability of a fourth dose or booster dose at 1 year of age when inoculation is begun during the neonatal period.

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Conference on Training

Sixty-five representatives of professional and educational groups will attend a national conference on public health training to be held in Washington, D. C., July 28-30, 1958, under the sponsorship of the Public Health Service.

Dr. Berwyn F. Mattison, executive secretary of the American Public Health Association, will be chairman of the meeting. Dr. Malcolm H. Merrill, director of the California Department of Public Health, will summarize conference conclusions.

The meeting will review responsibilities of local, State, and Federal agencies for the training of public health personnel. The Health Amendments Act of 1956 requires that a national conference be held to assist the Surgeon General of the Public Health Service in evaluating the public health traineeship program authorized by the act. The act also requires the Surgeon General to make an evaluation report to Congress by January 1, 1959.

The purpose of the traineeship program is to help alleviate the acute shortage of trained personnel in public health agencies. Under the act, the Public Health Service awards traineeships to individuals and makes training grants to schools offering graduate courses in public health. From August 1956 through April 1958, almost 1,000 persons received graduate training in public health through this program.

Table 4. Pertussis agglutination and diphtheria antitoxin titration 1 year following completion of inoculations, by type of antigen

| Pertussis titration | Diphtheria antitoxin units per ml. | | | | | | | | | |
|---------------------|------------------------------------|------|-----|-----|-------|--------------------|------|-----|-----|-------|
| | Aluminum phosphate | | | | | Aluminum hydroxide | | | | |
| | <0.01 | 0.01 | 0.1 | 1.0 | Total | <0.01 | 0.01 | 0.1 | 1.0 | Total |
| 1:1,280----- | | | | 1 | 1 | | | | | 0 |
| 1:640----- | | | | | 0 | | 1 | 1 | | 2 |
| 1:320----- | | | | 2 | 2 | | | | | 0 |
| 1:160----- | | | 2 | 6 | 8 | | | 1 | | 1 |
| 1:80----- | | | 5 | 2 | 7 | | | | 3 | 3 |
| 1:40----- | | | 3 | 3 | 6 | | | | | 0 |
| 1:20----- | | | | 1 | 1 | | 1 | 4 | 1 | 6 |
| 1:10----- | | 1 | 1 | | 2 | | 2 | | | 2 |
| <1:10----- | | 1 | 3 | | 4 | | 4 | 9 | | 13 |
| Total----- | 0 | 2 | 14 | 15 | 31 | 0 | 8 | 15 | 4 | 27 |

lost to the study before the third postvaccination specimen, 11 were in the aluminum phosphate group and 10 in the aluminum hydroxide group.

While the two antigens appeared comparable with respect to the diphtheria toxoid component, when viewed in the light of ability to meet the criteria set on the basis of antitoxin units per milliliter and agglutination titers, the aluminum phosphate adsorbed antigen was better than the aluminum hydroxide adsorbed antigen. In view of the multiplicity of factors that govern the occurrence of disease, including dosage of infection, specific immunity, and other resistance factors, it is difficult to establish arbitrary pertussis agglutination and diphtheria antitoxin levels above which a person is immune and below which he is susceptible. By utilizing the data in tables 3 and 4, however, one may compare the response to the antigens according to any desired combinations of pertussis agglutination and diphtheria antitoxin levels.

In general, the infants tolerated the inoculations very well. Many of the mild systemic reactions occurring within a few hours of injection were reported by the parent. Possibly, some of these were over-reported. Some of the local reactions observed by physicians and nurses, however, were unnoticed by the parent. Sauer observed a lower frequency of systemic and local reactions following aluminum phosphate adsorbed antigens than were observed

following the use of alum precipitated antigens (8). In our experience local and systemic reactions are more frequently discovered when infants are systematically observed by physicians or nurses than when the frequency of reaction is based on reports by the parent.

The results of the study support neonatal inoculation as a safe, effective, acceptable procedure. The type of antigen used appears to be of importance in view of the variations observed in response to available preparations. Furthermore, the loss of immunity as indicated by the agglutination and antitoxin levels 1 year after the third inoculation reemphasizes the need for a fourth injection or booster rose at approximately 1 year of age or earlier.

Summary

A group of infants was inoculated during the neonatal period with aluminum phosphate adsorbed or aluminum hydroxide adsorbed diphtheria-tetanus toxoid and pertussis vaccine, combined. The infants were observed up to 1 year following completion of the series of three inoculations.

Based on diphtheria antitoxin titrations, responses to the aluminum phosphate and aluminum hydroxide adsorbed antigens were comparable.

Based on pertussis agglutination titers 1 month and 1 year following vaccination, the aluminum phosphate was better than the alumi-

The charge was as high as \$1.25 in some of the business offices and stores since their vaccine was purchased at the commercial rate. A few stores absorbed the entire cost of vaccinating their employees.

The county health commissioner purchased \$36,000 worth of vaccine for the school and church clinics. Clinic sponsors reimbursed the commissioner at cost.

Publicity and Promotions

When plans for mass clinics were announced, one Salt Lake City newspaper, the *Deseret News*, carried a daily schedule of clinics that gave the time and place of all mass clinics for the coming week and information on how to schedule a new clinic with the medical society. They covered the progress of the local vaccination campaign and the national poliomyelitis situation. Thus, the mass immunization program was kept constantly before the public.

Vaccination reminders were sent to 97,000

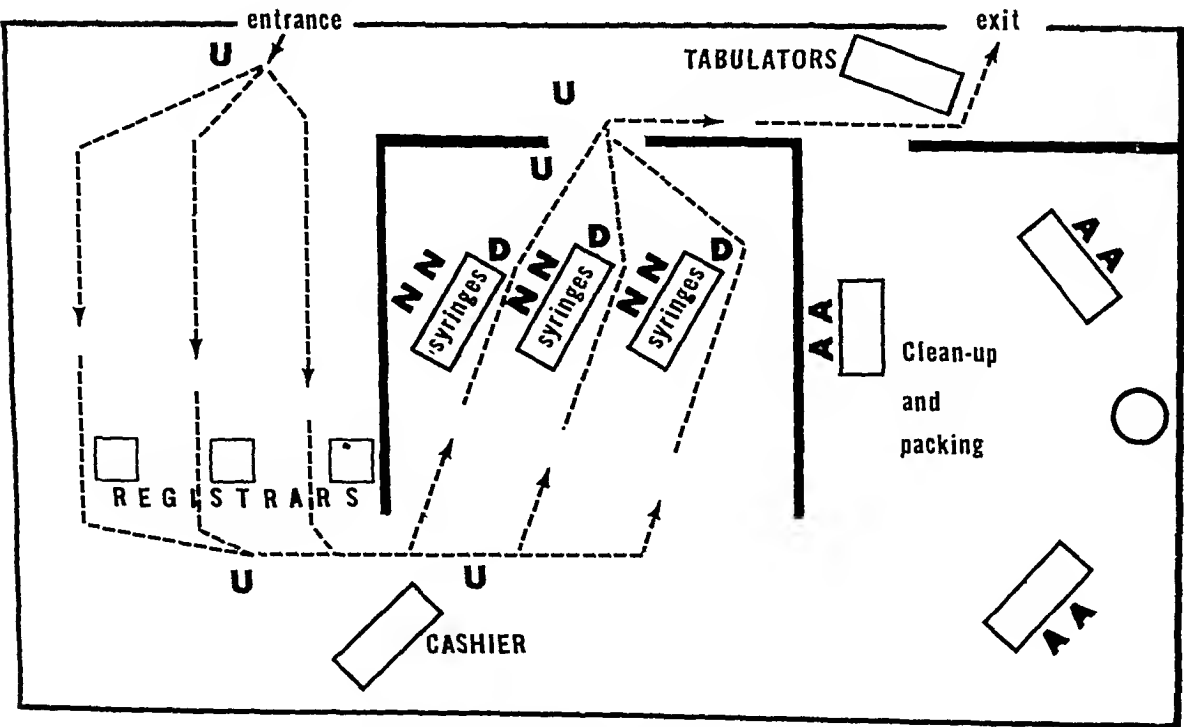
homes by 1 bank and 7 department stores along with their monthly statements. "Polio Won't Wait, Vaccinate" posters were placed in show-windows of downtown stores, utility companies, and banks. Newspaper advertisers used 1-inch squares of the same poster as inserts on their advertisements during the last 2 weeks of July.

Daily radio announcements were broadcast for the last 2 weeks of the clinics. There were six free-time, 10-minute interviews of different physicians concerning the need for Salk vaccinations.

One studio televised a "live" poliomyelitis immunization clinic for more than 100 employees. The vaccination of the employees was completed in 20 minutes by one physician, who carried on an interview while administering the injections.

As a promotional stunt, during the second school clinic, searchlights illuminated the area outside the school, and trade stamps were given with every injection. At the last clinics, free soft drinks were served.

Typical Clinic Design for Mass Vaccinations



D=doctor; N=nurse; U=usher; A=aide

Poliomyelitis Vaccination Campaign in Salt Lake City, Utah

JAMES E. BOWES, M.D.

ALMOST 400,000 shots of poliomyelitis vaccine were given in a mass immunization campaign in Salt Lake City, Utah, in 1957. From the inception of the campaign, arising from pressures of various civic groups early in 1957, until its end in July of that year, streams of people passed through clinics in schools, churches, department stores, and other places to receive their injections.

A total of 116,710 vaccine injections were given at clinics held in 127 schools, 25 churches, and 40 industrial firms, business offices, and stores. In addition, 275,130 injections were given in the offices of private physicians. Altogether, 62 percent of the city's residents were immunized.

The Salt Lake County Medical Society sponsored the vaccination program and appointed me as coordinator. Scheduling of clinics for all schools was begun at once through my office. Within 4 weeks all the schools and businesses that sought vaccination for their employees were accommodated. The nurses and equipment were supplied by the Salt Lake City and County Health Departments.

The first clinics were arranged for 500 employees of a major department store and for a junior high school where two students had died of poliomyelitis in 1956. For the school clinic, the PTA purchased vaccine from a local druggist at the commercial rate until it could be bought at the institutional price directly from drug firms.

The second school clinic was sponsored by a local Lion's Club. Newspaper and radio publicity resulted in a crowd of 2,450 persons. The challenge here was to obtain enough syringes so that there would be a separate one for each person.

The city health department had only 1,500 syringes. Four hundred more, relics of the poliomyelitis pioneer programs, were found in the basement of the State Capitol. All hospitals were asked to have syringes ready in case of need. Since the second clinic was to last from 6 p.m. until 10 p.m., the first 300 syringes used were cleaned, packed, and rushed to a nearby hospital for autoclaving and were returned for the last hour.

The problem of syringes continued to be the knottiest one of all throughout the campaign. Disposable syringes were too expensive: at 18 cents per unit, it would have meant \$180 in the waste basket for every 1,000 persons injected. Interchangeable 2 cc. syringes were best. Dr. Hingson's jet-injector, which injects 900 persons per hour would have been ideal, but it was not then available.

Monetary Considerations

When the immunization program was first considered, several physicians were opposed to mass clinics, preferring individual vaccinations in their offices. The medical society, believing that this method would fail to meet the citywide demand on short notice, agreed to a fee of \$15 per hour to be paid physicians who worked in the clinics.

At most of the clinics, each person was charged \$1, which covered the following costs: vaccine, 65¢; replacement of broken syringes, 3¢; cotton, alcohol, and acetone, 3¢; physician's fee, 7¢; and a surplus of 22¢ to allow for indigent persons. (Unused Federal funds were also allocated to purchase vaccine for anyone under 20 years of age and pregnant women. Free injections were given at the city and county health departments during August 1957. All nurses canvassed their areas and encouraged indigent groups to take advantage of this offer.)

Dr. Bowes is a private physician practicing obstetrics and gynecology in Salt Lake City, Utah.

level. Long-distance telephone calls revealed that four manufacturers favored bulk sales of vaccine to public health agencies; only small amounts were for distribution directly to physicians. One manufacturer was willing to split 50 percent of Utah's quota with commercial outlets for the private physician's use. Another manufacturer offered to make 2,000 bottles available to us immediately, on the condition that we purchase it through a public health agency.

A Salk vaccine bank was formed to provide vaccine for the mass clinics and to lend it to any physician in our county who could not obtain it through commercial sources. Responding to statewide demand, we lent 11,000 injections to 80 different physicians, 21,600 injections to 16 county health units in Utah, 140 to the Army and Air Force, and supplied 2 hospitals and 2 universities. Nearly every borrower returned the vaccine after commercial supplies were available.

School Survey

Since one of the prime objectives of the campaign was to immunize the school children in time for the poliomyelitis season, we conducted a survey to see if the objective was being met. A survey, based on the number of children present on 1 day, was conducted in all the city's 41 grade schools, 11 junior high schools, and 3 high schools.

Good immunization coverage was found in all grade and junior high schools in the upper third economic areas. However, 20 to 35 percent of the children in the poorest economic areas never received a single poliomyelitis injection. Two high schools still had 35 percent of its students without vaccinations.

A clinic was arranged in each school where there were at least 40 students present who had never been vaccinated. Since only the sixth and seventh grades were considered reliable in our survey, the need in the lower grades was estimated proportionately to the response in the upper classes.

Clinics were held during 1 class hour in 31 schools over a 3-day period. During these "mop-up" clinics, 1,980 injections were given, greatly increasing the immunization level. The

\$1 charge was waived for any child who could not afford it.

Final Phase of Clinics

For the conclusion of our program, we set up 17 city and suburban clinics in schools throughout the area. We held only 1 clinic each day, from 1 p.m. to 8 p.m., so that the full staff of city and county health department nurses and all syringes and needles would be available.

Since this period lasted 16 days, persons getting a first shot during the initial July clinics could attend one again in 14 days and receive their second injection. Dr. John G. Bachtold and Dr. Lonis P. Gebhart, virologists of the University of Utah, advised the committee on the effectiveness of spacing the various injections. Since the poliomyelitis season was fast approaching, they allowed a minimum 10-week interval between the second and third injections rather than the usual 7 months.

At 9 city clinics, injections were given 17,443 persons, and at 8 suburban clinics 11,963 were vaccinated. More than 4,000 of these received their first shots. At the last clinic, held on July 31, 1957, we vaccinated 3,500 persons.

Operations

The accompanying figure depicts our flow chart when 1,000 persons were expected to be vaccinated within 1 hour's time. This rate of injections required 3 doctors, 6 nurses, 6 clerks, 6 ushers, and 6 women for cleaning and packing syringes.

The best attendance was at 6 p.m., and the worst between 2 p.m. and 4 p.m. Nurses began setting up tables and loading syringes 1 hour in advance of a specified beginning time, for it was our experience that if 1,000 persons were expected to attend, more than 100 persons were in line one-half hour before time. We started our injections ahead of time to create public goodwill.

There was no attempt to keep a registry of persons getting injections other than completing a shot-record card and tabulating the number attending.

The nursing service from the Salt Lake City

Vaccine Shortage

A vaccine shortage in March created a momentary panic in the poliomyelitis committee, for two big clinics of nearly 1,000 each had been scheduled. The *Deseret News* contacted the Public Health Service in Washington, D. C., about the shortage and found it was nationwide. Mass clinics throughout the country had exceeded the manufacturers' estimates.

Telephone calls on this black March 13 to a drug firm brought part of our back order in 4 days. The National Foundation for Infantile Paralysis gave me \$1,000 to purchase any vaccine available in the State. Only twenty 9-cc. vials of Salk vaccine were found in 24 drug-stores in 8 cities.

In the meantime, the National Foundation found 500 vials of vaccine in Reno, Nev., not being used. It was shipped by commercial airline in time for the clinics that night. A 1,200-bottle shipment came through in several days and kept us going for another month.

On April 11, another vaccine shortage occurred because of a delay in shipment. *Deseret News* officials arranged with the Utah Air National Guard to send a jet to Indiana to pick up 1,200 bottles of vaccine. The airplane made the 3,000 mile roundtrip flight in 10 hours, returning the same day with enough vaccine for that night and the next several weeks.

By mid-April, private physicians were short of vaccine. We visited a drug wholesaler and found the problem was at the manufacturers'

Poliomyelitis Vaccination in Bucks County

A Japanese print called "A Chest Full of Goblins" was used as a scary eye-catcher in a poliomyelitis vaccination campaign by the Bucks County (Pa.) Department of Health through county newspapers, beginning in early March 1958.

"Bucks County needs 400,000 more polio shots" were key words used in the opening statement of the campaign by Dr. Jackson Davis, director of the Bucks County Department of Health.

He commended the medical society of the county for its vote in February to encourage physicians to set up office hours periodically for administering poliovirus vaccine at a reduced fee, and urged a call to the family doctor to learn the hours set. Dr. Davis emphasized that "the odds are now 2 to 1 for paralysis if your child under 5 years gets poliomyelitis."

Statistical facts which he gave for the disease disclosed no confirmed cases in Bucks County in 1957, in spite of the fact that only 40 percent of the most vulnerable group, infants and children under 5 years of age, had received even one injection of poliovirus



vaccine. "Will our luck hold in 1958?" he asked.

The approximately 225,000 poliomyelitis shots that were administered in Bucks County, he pointed out, were chiefly in children 5 through 19 years of age.

A method based largely on Bureau of the Census data reveals that since 1910 considerable change has occurred in the timing and duration of the period of childbearing in the United States.

Age of Women at Completion of Childbearing

LINCOLN H. DAY, Ph.D.

MORE than 90 percent of the women in the United States eventually marry (1), and 85 to 95 percent of those who marry before the age of 45 become mothers (2). Hence, changes in the length and timing of the childbearing period may have important social effects on large numbers of American women and, through them, on the other members of society as well.

This paper will discuss an attempt we have made to determine the proportion of women who had completed their childbearing by the time they had reached certain ages. An analysis of the age-specific birth rates for women in various age cohorts could afford some indication of any change which might have occurred in these proportions; but the method is somewhat inadequate because it not only fails to denote the number of women who had completed their childbearing, but because it also gives only a very crude indication of their age distribution. The method devised by us to assemble the data for this article falls prey to neither of these shortcomings. It is, however, not entirely free of certain others of its own.

The census data from which we derived our basic information are available only for the years 1910, 1940, and 1950. For purposes of

this study it was assumed that a mother had completed her childbearing if she had not borne a child for a period of at least 5 years. Although such an assumption is not invariably true, it was necessitated by the character of the relevant data, data in which mothers were subdivided by whether they were with or without children under 5 years of age.

A partial check of the validity of this assumption was made by the use of recent data on child spacing gathered by Schachter and Grabill (3), together with data from the Indianapolis study analyzed by Whelpton and Kiser (4) and a tabulation of the estimated ages of siblings of 565 freshman scholarship candidates at Mount Holyoke College. On the basis of these rather disparate materials, it appears that not more than 20 percent of the mothers had let 5 or more years elapse between births.

Admittedly, this percentage is somewhat higher than could have been hoped for. A figure closer to, say, 10 percent would have been a better validation of the assumption upon which our study is based. However, the women in each of these three studies went through their childbearing periods during the depression and subsequent war period. The only exception, and it is but a partial one, is the group studied by Schachter and Grabill. The percentage of mothers in their group who had not completed childbearing was somewhat less than the percentage for the other groups. On the basis of

Dr. Day is assistant professor of sociology, department of economics and sociology, Mount Holyoke College, South Hadley, Mass.

and County Health Departments was indispensable. After their regular duties, the nurses spent many evening hours setting up and conducting clinics. Hundreds of volunteer nurses assisted them in keeping records, ushering, and cleaning and packing syringes and needles.

Results and Conclusions

Tabulation sheets used at each clinic provided an accurate count of the injections given. In the city, the number was 66,170, while in the county (suburbs) it was 50,540. A more detailed age distribution record, kept in the

city clinics, revealed our poorest attendance was in the group 15-19 years old. Of those over 40 years old, 11,198 were given injections even though publicity was not directed toward them.

To get an idea of the total immunization coverage in our community, we conducted a telephone survey, sampling the 88,000 private family listings in the directory. A total of 391,840 injections were given. Since the public clinics had administered 116,710 injections, the remaining injections must have been given by private physicians in their offices. An obvious conclusion may be drawn: Mass clinics do not take patients away from private physicians.

School Announcements

University of Minnesota. From July 21 through August 1, 1958, the School of Public Health will hold a workshop on radiological health in industry and the community. The course is designed for physicians, nurses, chemists, sanitarians, and others concerned with such health problems.

Topics to be covered in the workshop include: introduction to radiation; sources of radiation exposure; atomic structure; radioactivity; X-rays; interaction of radiation with matter; units of measurement; natural and artificial background; biological and genetic effects of radiation; maximum permissible levels; principles of radiation protection; and public health aspects of radiological health.

For further information, write to the School of Public Health, 1325 Mayo Memorial Building, University of Minnesota, Minneapolis 14.

Massachusetts Institute of Technology. The Institute offers a 2-week special summer program in air pollution from August 11 through August 22, 1958. Intended primarily for industrial, chemical, mechanical, and sanitary engineers who wish a better understanding of the broad concepts of air pollution control, the program will cover the meteorological

problem, toxicology and public health, aerosol technology and air cleaning, and air analysis, along with legislative and regulatory acts. No formal background, however, is required in meteorology or physiology. Academic credit is not offered. Write the Massachusetts Institute of Technology, Cambridge, for further information.

Harvard University. A new division of environmental hygiene has been added to the School of Public Health. Radiation hazards, air pollution, accident prevention, and industrial hygiene will comprise the curriculum and research activities in the new division.

University of Michigan. The department of environmental health of the School of Public Health has expanded its radiological health curriculum from 1 to 7 courses for the 1958-59 school year.

To the current course on radiological health have been added fieldwork in radiological health; radiation biology; techniques used in radioactive air, water, sewage, and stream pollution studies; radiological health seminar; disposal of radioactive wastes; and a second part of radiological health.

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Whelpton's recent studies of cohort fertility (5), it is likely that this deviation of about 20 percent from our definition of completed childbearing results from the partial making up, by women born between approximately 1903 and 1915, of births postponed during the depression.

Determining the difference in years between the age by which each cohort had borne 25 percent of its births and the age by which it had borne 90 percent, it was found that the difference was greater for the cohorts of 1903-15 than for those born earlier; and that, if present trends continue, this difference will be smallest of all for cohorts born after 1915. Women born before about 1903 seem not to have "made up" for births postponed during the depression; while women born after about 1915 seem to have been little affected by the depression, so far as any necessity to make up for postponed births is concerned.

This making up of births is probably the main factor in the 20 percent deviation from our definition of completed childbearing, although there is also a certain proportion of women who bore an additional child after a period of more than 5 years in each of the census years for which we have data. On the basis of the three studies mentioned above, it would appear that most of these were women who had allowed only 6 years to elapse between successive births.

Estimation of Error

Before making estimates of the proportions of women who had completed childbearing, adjustments were made on the census data themselves in order to lessen as much as possible the chance of error arising from any source other than the basic assumption. One adjustment was for under-enumeration of births; the other, for infant and child mortality.

The 1950 data published in the census report on fertility (2) had been partially adjusted for under-enumeration; those for 1940 and 1910 had not (6a, 6b). In the appendix to its 1945 report on differential fertility (6a) the Bureau of the Census cites certain findings from a special tabulation of schedules from the 1940 census. Undertaken to obtain information on the fertility of ever-married women who had made no report of the number of children ever born

the tabulation revealed striking differences, both in the number of children ever born and in the proportion who had remained childless, between the women who had failed to report on the number of children ever born to them and the women who had so reported. By a method involving the application of two sets of fertility ratios, that is, number of children 0-4 years old per 1,000 women in a given age category, one set from this special tabulation and the other from the regular census enumeration, we were able to make an estimate of the total number of mothers in each age group who had completed childbearing in 1940. Then, on the assumption of relative equality between the respective ratios in 1940 and 1910, we made a similar estimate for the earlier year.

An example of the difference this adjustment for under-enumeration makes is shown in table 1, which compares the proportions of "completed" childbearing derived from unadjusted and adjusted census data for native whites and Negroes. The main difference is found in the earlier ages, denoting considerable under-enumeration of children born to younger mothers. In some instances this has amounted to a decrease between the adjusted and unadjusted figures of 50 percent for native whites and 30 percent for Negroes. That the proportional changes occasioned by adjustment for the effects of under-enumeration were generally larger for whites than for Negroes is due not to a more complete enumeration of Negroes, but to the relatively greater effect on the Negro data of an additional adjustment for infant and child mortality.

An adjustment for infant and child mortality was necessary because of the importance to our calculations of data on the number of mothers with children under 5 years of age. By our method, were mortality not taken into account, if a child had been born and had died within 5 years of the census the mother would be tabulated as a woman of completed fertility if she had no other children under 5 years of age, whereas if the child had lived, the mother would have been counted as a woman of uncompleted fertility. For this reason an "adjustment factor" derived from life table d_1 values (7-9) was applied to each group of mothers.

In calculating this adjustment factor, an estimation was made of the number of children born to mothers in each 5-year age group within 5 years of the census and dying before the census was taken. In its actual calculation, the adjustment factor was made a function of both the level of infant and child mortality and of the number of children born to women in each age group. The adjustment does not take into account abortions or stillbirths, although these might have been of some consequence in the duration of childbearing.

Table 2 gives a sample comparison of the difference this adjustment for mortality makes in the proportion of "completed" childbearing in each age group. As with the adjustment for under-enumeration, the largest differences are

at the younger ages. This should be expected because of the higher proportions of younger women who have borne but one child and who therefore have no other child under 5 years of age to put them in the "childbearing uncompleted" category.

From the basic findings shown in table 3, three general facts can be noted: (a) there have been changes since 1910 in the ages at which most women complete childbearing; (b) these changes have been in the direction of a greater concentration of childbearing in certain ages, that is, an earlier average age of women at completion of childbearing and a higher proportion who finish childbearing earlier, and (c) certain demographic developments during the depression decade of the 1930's differed markedly

Table 1. Proportion of all mothers with no children under 5 years of age, adjusted and unadjusted for under-enumeration,¹ by age and race of mother: United States, 1940 and 1910

| Age (years) | Native white | | | | Negro | | | |
|----------------|--------------|----------|------------|----------|------------|----------|------------|----------|
| | 1940 | | 1910 | | 1940 | | 1910 | |
| | Unadjusted | Adjusted | Unadjusted | Adjusted | Unadjusted | Adjusted | Unadjusted | Adjusted |
| 15-19----- | 19.6 | 9.4 | 28.1 | 18.4 | 24.6 | 17.6 | 35.7 | 28.5 |
| 20-24----- | 14.6 | 9.7 | 18.0 | 14.4 | 31.2 | 27.4 | 33.0 | 30.0 |
| 25-29----- | 29.3 | 26.9 | 24.0 | 22.5 | 50.6 | 48.2 | 43.4 | 41.6 |
| 30-34----- | 50.6 | 49.6 | 38.6 | 37.9 | 65.1 | 64.3 | 53.2 | 52.3 |
| 35-39----- | 69.9 | 69.2 | 53.1 | 52.7 | 74.2 | 73.5 | 60.9 | 60.4 |
| 40-44----- | 84.9 | 84.5 | 71.4 | 71.2 | 84.3 | 83.8 | 74.6 | 74.2 |

¹ Figures adjusted and unadjusted for discrepancies in reported childbearing between women who reported on the number of children ever born and women who did not so report.

Table 2. Proportion of all mothers with no children under 5 years of age, unadjusted and adjusted for infant and child mortality,¹ by age and race of mother: United States, 1940 and 1910

| Age (years) | Native white | | | | Negro | | | |
|----------------|--------------|----------|------------|----------|------------|----------|------------|----------|
| | 1940 | | 1910 | | 1940 | | 1910 | |
| | Unadjusted | Adjusted | Unadjusted | Adjusted | Unadjusted | Adjusted | Unadjusted | Adjusted |
| 15-19----- | 9.4 | 4.7 | 18.4 | 4.8 | 17.6 | 10.0 | 28.5 | 10.3 |
| 20-24----- | 9.7 | 5.1 | 14.4 | .2 | 27.4 | 20.7 | 30.0 | 12.2 |
| 25-29----- | 26.9 | 23.5 | 22.5 | 9.1 | 48.2 | 43.4 | 41.6 | 26.8 |
| 30-34----- | 49.6 | 47.0 | 37.9 | 27.2 | 64.3 | 61.0 | 52.3 | 40.1 |
| 35-39----- | 69.2 | 67.6 | 52.7 | 44.5 | 73.5 | 71.1 | 60.4 | 50.3 |
| 40-44----- | 84.5 | 83.7 | 71.2 | 66.2 | 83.8 | 82.4 | 74.2 | 67.6 |

¹ All figures adjusted for under-enumeration. Those in the "unadjusted" column have only this single adjustment. Those in the "adjusted" column have been adjusted also for infant and child mortality.

Table 3. Proportion ¹ of all mothers with no children under 5 years old, by age, race, and residence of mother: United States, 1950, 1940, and 1910

| Race and age | Total United States | | | Urban | | | Rural nonfarm | | | Rural farm | | |
|---------------------|---------------------|------|------|-------|------|------|---------------|------|------|------------|------|------|
| | 1950 | 1940 | 1910 | 1950 | 1940 | 1910 | 1950 | 1940 | 1910 | 1950 | 1940 | 1910 |
| Total: ² | | | | | | | | | | | | |
| 25-29----- | 18.9 | 25.6 | 11.7 | 19.3 | 27.8 | 18.6 | 19.9 | 24.7 | 12.1 | 16.1 | 19.4 | 4.1 |
| 30-34----- | 39.8 | 48.2 | 28.8 | 40.0 | 52.2 | 39.2 | 40.8 | 47.4 | 28.2 | 37.6 | 38.8 | 16.9 |
| 35-39----- | 60.6 | 67.9 | 45.2 | 62.5 | 73.7 | 58.3 | 59.0 | 66.7 | 44.0 | 54.5 | 54.6 | 30.4 |
| 40-44----- | 81.1 | 83.5 | 66.3 | 83.7 | 88.4 | 77.6 | 79.2 | 83.1 | 66.5 | 72.3 | 72.6 | 52.6 |
| 45-49----- | 95.5 | 94.9 | 88.9 | 96.7 | 97.0 | 93.8 | 94.6 | 95.1 | 89.0 | 91.3 | 90.2 | 85.8 |
| White: ³ | | | | | | | | | | | | |
| 25-29----- | 17.4 | 23.5 | 9.1 | 17.1 | 25.0 | 14.9 | 19.0 | 23.6 | 8.2 | 15.6 | 17.8 | 2.4 |
| 30-34----- | 38.8 | 47.0 | 27.2 | 38.3 | 50.2 | 36.8 | 40.6 | 46.6 | 26.4 | 37.9 | 38.3 | 15.4 |
| 35-39----- | 60.3 | 67.6 | 44.5 | 61.7 | 72.9 | 56.9 | 59.2 | 66.6 | 43.0 | 55.6 | 54.9 | 29.7 |
| 40-44----- | 81.2 | 83.7 | 66.2 | 83.4 | 88.4 | 76.9 | 79.5 | 83.2 | 66.2 | 73.4 | 73.1 | 52.5 |
| 45-49----- | 96.1 | 95.3 | 89.6 | 96.9 | 97.2 | 93.9 | 94.9 | 95.3 | 89.7 | 92.2 | 91.2 | 87.3 |
| Nonwhite: | | | | | | | | | | | | |
| 25-29----- | 34.2 | 41.3 | 26.2 | 38.6 | 52.4 | 46.1 | 30.9 | 36.6 | 30.7 | 19.0 | 27.6 | 11.9 |
| 30-34----- | 51.4 | 59.5 | 39.5 | 57.5 | 70.3 | 59.6 | 44.0 | 57.6 | 38.7 | 34.8 | 41.7 | 24.8 |
| 35-39----- | 63.9 | 70.0 | 49.7 | 70.6 | 79.7 | 69.9 | 57.0 | 67.7 | 50.4 | 46.9 | 53.0 | 34.2 |
| 40-44----- | 80.9 | 81.9 | 67.1 | 86.9 | 88.4 | 84.5 | 76.0 | 82.2 | 68.7 | 64.1 | 69.6 | 53.1 |
| 45-49----- | 92.2 | 91.3 | 84.1 | 94.5 | 95.5 | 93.8 | 90.9 | 93.0 | 84.8 | 84.8 | 83.4 | 76.5 |

¹ Computed from data adjusted for under-enumeration and for infant and child mortality.

² Nonwhites together with only native whites for 1940 and 1910.

³ Native whites only for 1940 and 1910.

from those which preceded it, and these developments have not been extensively continued since that time.

Among these findings, those for 1940 are somewhat anomalous. On the surface it would seem that the most extensive change in the direction cited was between 1910 and 1940, with a change in the opposite direction between 1940 and 1950. Evidence of a sizable change between 1910 and 1940 can be seen not only in the data under discussion but also in the cohort data collected and analyzed by Whelpton (5).

But whether a change in the opposite direction occurred between 1940 and 1950 is doubtful, in view of the information we have developed from Whelpton's data. By updating his table A for the years through 1954 and then estimating the additional parity-order births which would occur before the end of the period of childbearing, it was possible to make various calculations for cohorts born as recently as 1925. These calculations were used to estimate the ages of the cohorts at the time various proportions of their children either had been born or, for cohorts whose fertility had to be estimated, will have been born.

Obviously, these estimates are subject to error. But since they were made solely for the years near the end of the childbearing period, when but a small proportion of all births occur, even substantial errors should have only a minor effect on the total for cohorts of women born before about 1918. For those born after that date, however, the risk of error in calculations of fertility rates is greater, varying directly with the year of birth.

Despite these limitations, the pattern set by the cohorts for which more data had to be estimated follows quite closely the pattern set by those cohorts for which it was necessary to estimate few or no data. These two sets of data show that, for the cohorts in the childbearing ages in 1940, there had been a generally wider distribution of childbearing in the preceding decade than there had been for cohorts in the childbearing ages in 1950. That is, the period between, for instance, the 25th and 90th percentile births was longer for the cohorts in the childbearing ages in 1940 than for those in the childbearing ages in 1950. This was partly the result of a higher incidence of delayed marriage in the depression years of the 1930's.

If to the fact of delayed marriage we add the fact that our own data are based on the assumption that a mother has completed her childbearing if she has not borne a child for 5 years, it becomes clear that what between 1940 and 1950 appears to be a reversal in the trend toward earlier completion of childbearing may actually be something quite different. Possibly the higher percentages of women who had seemingly completed childbearing by certain ages in 1940 are largely the result of an unusually high proportion of women who, because of conditions during the 1930's, allowed five or even more years to elapse between certain of their births. The increased birth rates for women above age 35 in the late 1930's and early 1940's (10) would lend credence to this view. In short, if anything, the childbearing patterns of women tabulated in the 1940 census represent not so much an advanced stage in the trend toward a shorter period of childbearing as they do a temporary plateau or even reversal of that trend. The important comparisons, then, are those which are to be made between 1910 and 1950, rather than between either of those years and 1940.

Socioeconomic Factors

In considering the relation between childbearing and various socioeconomic classifications we are limited to three variables: race, rural-urban residence, and number of years of schooling.

In comparison with whites, there is a higher proportion of Negro women at either extreme of the childbearing process: on the basis of our definition, a higher proportion of Negro women than of white women complete their childbearing before age 35, while at the same time, a higher proportion also continue to bear children in the later years of the fecund period. Among women of both races, childbearing in the upper ages is most common among those who do not know how to prevent unwanted pregnancies or who are unwilling to accept planning in such a highly personal area of life. This condition, related as it is to low income and scant educational opportunity, is much more common among Negroes than among whites.

On the other hand, the social conditions in which many Negroes have been found to live are likely to lower fertility either through the separation of spouses, which lessens the chance of conception, or for other reasons, such as the contraction of venereal disease, which frequently leads to sterility and pregnancy wastage (11). Many persons who have lived under these conditions may eventually form stable marital relationships; but since fecundity in women declines gradually after about age 25 and more rapidly after about age 30, they may achieve this stability too late for them to bear any, or more than 1 or 2, children.

We have, then, a situation among Negroes in which the ignorance and poverty of a large number has tended to produce a generally longer period of childbearing while at the same time, a considerable amount of personal and social disorganization among others has tended to produce a generally shorter period of childbearing. Our data bear this out by showing, in comparison with whites, a higher proportion of childless Negro women, a higher proportion completing their childbearing in the younger ages, and a higher proportion continuing to bear children in the upper ages. What is unusual about childbearing among Negroes is not the fact that a certain number of women continue to bear children throughout the whole fecund period, whereas others bear only a few or none at all. The unusual character of Negro childbearing derives from the fact that it is dispersed over a wider age range than that of whites.

With respect to rural-urban differences in the proportion of completed fertility, the general trend among white women has been toward less diversity among the three available residential groupings (urban, rural nonfarm, and rural farm) in the proportion of women who have completed childbearing at any given age. The sources of this greater homogeneity are two: (a) a greater proportion of rural women are finishing their childbearing earlier than in the past; and (b) a greater proportion of urban women are finishing their childbearing later.

With the rural areas showing the greater change, the result has been a decrease in the considerable urban-rural differential which

formerly existed. The rural trend is part of a general decline in fertility; the trend in urban areas, however, seems to derive in large part from an increase in births during the "baby boom" after World War II. Were we able to compute the proportions of "completed fertility" on the basis of data for years more recent than 1950, we should probably find among urban women a partial return to the higher percentages of the pre-war years. But it is still likely that the urban-rural differentials will decline further in the future.

Although similar changes for urban and rural groups have occurred among nonwhites, there is not the degree of homogeneity that we find among whites. The differences between residential groupings of nonwhites were smaller in 1950 than in 1910, just as they were among whites. But the changes were considerably smaller among nonwhites than among whites.

Because there is in the United States considerable evidence of a close association between number of years of schooling and socioeconomic status, an analysis of data on childbearing, subdivided according to years of schooling, affords an indication of the differences in timing and duration of childbearing among the various social strata. Such an analysis must be limited to 1940, however, because data for 1910 do not exist, while those for 1950 are in a form unsuited to this kind of analysis.

Our studies show that, among both whites and Negroes, there is greater similarity between rates of completion of childbearing for mothers with the most schooling and for mothers with the least schooling than between the rates for either group and those for women with a grammar or high school education.

The reasons for the similarity in fertility rates between mothers with the most and mothers with the least schooling were quite different, however. Among women with few years of schooling the dominant pattern was one of continual childbearing, even into the upper ages; among women with some college education the pattern was generally one of later marriage. The result, at least in 1940, was a higher proportion of completed fertility at each age among women with some high school education than among the groups with either

less or more than a high school education. But because of generally smaller families, the actual number of years spent in childbearing was less for the groups with more schooling. On the average, the more years of schooling, the fewer years devoted to childbearing.

Demographic Factors

In the present study the causal factors, however numerous and diverse, and however complex their interrelationship, affect the timing and duration of childbearing through only three demographic factors: (a) average size of family; (b) age of mother at birth of first child; and (c) lapse of time between successive births. To the extent that the paucity of data permits any analysis, we have found that not all of these factors have operated in the same direction.

Despite certain tendencies which lengthen the period of childbearing, women today are finishing their childbearing at earlier ages than formerly, first, because of a decline in family size, and second, because of a generally younger age of the mother at birth of the first child.

Median family size has declined considerably since the earlier part of the century, approximately 50 percent for native whites and 60 percent for Negroes (2, 5). In the 1930's this meant a high proportion of childless and one-child families. Today it means a general increase in the proportion of families with 2, 3, and 4 children. In both instances, the change has been characterized by a continual decrease in the proportion of large families, that is, those with six or more children.

With the exception of the depression decade, the average age of the mother at birth of the first child has also decreased considerably since the earlier part of the century, about $1\frac{3}{4}$ years between 1890 and 1950 (12, 13). This is largely the result of an earlier age at first marriage, particularly since 1930.

Although the childbearing period in the United States has been shortened, the available evidence suggests that there has been a tendency in recent years for women to bear children at somewhat longer intervals. This is in keeping with the recommendations of modern obstetricians and is doubtless made possible

largely through the more widespread practice of birth control.

The increased incidence of divorce and the separation of husband and wife because of universal military conscription also apparently act more to lengthen the average period of childbearing than to decrease it through effecting any general decline in the number of children per family. This is partially compensated for to the extent that widowhood in the childbearing ages has declined. But it is our conclusion that the gain in time for childbearing which has resulted from less widowhood has not counteracted the losses occasioned by more divorce, together with separation of spouses in response to universal military conscription. The relative shortness of the 2-year term for draftees and the high remarriage rate for divorcees (14, 15) have apparently resulted, not in a smaller family size, with the attendant possibility of completing childbearing at an earlier age, but simply in postponement or prolongation of the period of childbearing among these groups.

Discussion

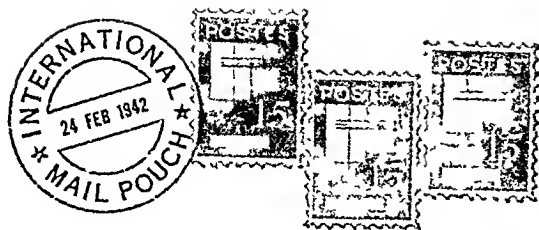
In this brief summary it is not our purpose to discuss the implications of a shortening of the childbearing period among American women or of a change in its timing. Such a fundamental alteration of the basic institution of the family can, of course, have far-reaching effects on various other aspects of the society and its culture. What effects these changes have will depend on the uses to which women put the added years of relative freedom from housework and child care activities.

There is some evidence of an increase in the participation of women in both politics and the labor force. This is particularly true of women from the middle and upper social strata, which may help to explain the publicity it has received in the mass media. To what extent this participation is accounted for by changes in the pattern of childbearing we cannot presently determine. Nor can we at this time do more than speculate concerning the further effects of this participation on such social phenomena as the status of women, patterns of childrearing, and the system of social stratification. But there can be little question that each of these phenomena is at least partially influenced by

the behavior of woman in her fundamental role of wife and mother, and that such behavior is to a considerable extent a function of the timing and duration of her childbearing.

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Pengamats, Mantris, and Controllers

Because Indonesia's malaria control program needed intermediate supervisors, the new position of "pengamat malaria," between the ranks of "mantri" and "controller" was created. Pengamat rank gives technicians, called mantris, an additional opportunity for advancement, as well as providing middle-echelon supervision. The first class for potential pengamats has been started.

The top-ranking supervisors, controllers, are secondary school graduates who are trained in public health and malaria control for 3 years. They then spend 9 months in India, Thailand, or the Philippines in field training and observation of malaria control programs.

Before beginning their work in Indonesia, controllers are given a month's course in public administration to bridge the abrupt psychological change from student to supervisor. The concentrated course covers recordkeeping, personnel practices, job analyses, essentials of supervision, and similar subjects.

—HAROLD A. WOOD, M.D., *chief, Public Health Division, U. S. Operations Mission, Indonesia.*

Filipino Five-Year Plan

Less than a third of the 31 engineers now employed in public health and only a small percentage of the present 2,013 inspectors in the Philippine Department of Health have had specialized training in sanitation. At least 3,400 inspectors are needed. The Philippine government presently has only one sanitary engineer per 700,000 population. The needed engineers may be graduated by the Institute of Hygiene of the University of the Philippines, which granted a master's degree in public health engineering for the first time in 1957.

To prepare inspectors, pilot projects will be launched in two areas selected for both rural and urban characteristics. The projects, demonstrating good sanitary practices in water supply, sewage and

garbage disposal, and rodent control, will be carried out by the training centers where local sanitary engineers and inspectors can gain needed experience.

Three similar pilot projects, requiring a minimum of 5 years to complete, will be set up at other centers. The broad plan for environmental sanitation culminates 2 years of work by local, ICA, and WHO personnel.

—ALBERT P. TALBOYS, *sanitary engineer, U. S. Operations Mission, Philippines.*

Flowers and Privies

In Pedro Pablo Gómez, a village of 232 houses in the coastal area of Ecuador, 217 families paid for their own sanitary pit privies. Privies were installed at the rate of 14 per day.

In nearby Jipijapa, spring floods destroyed the dam which impounded the water for the public supply system. To relieve the emergency, several wells were dug by hand under the supervision of health servicio technicians. School children fenced in small areas around the wells and planted flowers and shrubs to show their appreciation.

—JAMES D. CALDWELL, *chief, health, welfare, and housing field party, U. S. Operations Mission, Ecuador.*

A Phoenix in Reyes

Three years of effort vanished when a vandal lit the fire which destroyed Reyes' newly completed hospital-health center. Fortunately, although servicio's engineering division had finished the two-story cement and wood building in the little Bolivian town, the center's equipment was not yet installed. Only the damaged walls, the sanitary system, and the tiled first floor remained.

Since building the center was the final phase of health facilities construction, Servicio Cooperativo Interamericano de Salud Pública could not assure the town of funds to reconstruct the health center. But Reyes' 2,000 people collected enough money and material to rebuild it on a more modest scale. SCISP is providing technical engineering and administrative assistance.

—HAROLD S. FREDERIKSEN, M.D., *chief, health, housing, and welfare field party, U. S. Operations Mission, Bolivia.*

Previously undiagnosed illness among adults discovered through a survey in East Harlem indicates the need for expanded health education.

Multiphasic Screening Program in a Low Income Area

FANNIE I. TOMSON, M.D., M.P.H.

THE East Harlem Health District, covering an area of 1.6 square miles, lies in the northeastern corner of Manhattan Island. Of its 195,000 inhabitants, about two-thirds have low incomes. About one-half of the population are Puerto Ricans; a small percentage are Negroes.

Within the district are 3 large teaching hospitals with a total capacity of 2,289 beds and extensive outpatient services. All 3 are affiliated with medical schools and all 3 have schools of nursing. Of 408 physicians who have offices in this area, by far the majority are specialists serving the city as a whole, but 105 of them indicated that they are engaged in general practice.

In spite of the accessibility and availability of excellent medical care resources within the district and in the adjacent areas, it has been the impression of the staff at the East Harlem Health Center that the population avails itself of these resources only for emergency care and for acute illness. Unless hospitalization is indicated and made available, treatment is begun in the outpatient service and may never be completed because the patient is too ill to travel to the hospital for continued observation.

It is our impression that the home rarely provides for any medical care. This impression

is based on the broad experience of the health center's staff, gained from more than 128,000 visits by patients each year to our service facilities and the more than 8,000 field visits annually that our nurses make. For example, out of a register of 437 East Harlem residents with active tuberculosis, only 9 are under the care of a private physician.

Lack of care in the home is also evident in the large percentage of the elementary school population of 30,436 for whom the health center provides a school health service. Of 5,560 examinations of these children during the 1955-56 school year, 89.9 percent were done by school physicians of the New York City Department of Health. Except for some service provided by the city's department of welfare for its clients, no agency in the district provides free at-home medical care.

On the basis of the available rates, the East Harlem District falls into the quartile having the highest morbidity and mortality in the city. Measures for early case finding, highly desirable in any area, seem, therefore, to be particularly needed in this district. Children from infancy through high school age get a large measure, if not all, of the preventive services they receive from the child health stations and in the school health program. For adults, preventive services at the health center are limited to its chest, social hygiene, and cancer detection clinics. The hospitals provide little, if any, of this type of service.

Dr. Tomson is district health officer at East Harlem Health Center, New York City Department of Health.

In order to assay the situation to some degree, the East Harlem Health Center conducted a series of three multiphasic screening programs on three evenings in the spring of 1956. On the basis of an estimated capacity for 200 screenings an evening, we set a goal of 600 patients. Our health education campaign for 3½ months preceding the first screening night included letters to all suitable community agencies and organizations, press releases in English and Spanish, and, on request, speakers for scheduled meetings. Posters were distributed throughout the area. The staff of the center was asked to refer East Harlem adults who were not already patients at one of the three clinics

It is noteworthy that 306 of the 435 patients (70 percent) were referred to the center by a parent-teacher association from a single school in the area. This parents' group from a school with 1,633 students, 95 percent of them Puerto Rican, was active in spreading information about the survey and in urging members to participate. This group received a good orientation on what to expect on the screening nights and on the course of the subsequent followup.

Methods and Criteria

At the screening sessions a total of 435 persons were examined. A maximum number of nine diagnostic procedures were available to a patient. Only 16 persons had all 9 tests, and only 10 persons had fewer than 5. The average number per patient was 6.

The patients were weighed and measured, and a panel of physicians checked their skin, mouth, eyes, and mucous membranes, and gave them a quick nutrition evaluation.

Chest X-rays were taken on 70-mm. film, following the standard procedure set up by the New York City Health Department's bureau of tuberculosis. Persons with unsatisfactory or suspicious X-rays were recalled for a standard 14" by 17" X-ray and followup in the chest clinic. Cardiac pathology was picked up by the same service.

Blood specimens were drawn for serologic and blood sugar tests. The Mazzini test was used to screen for syphilis in accordance with the standard procedure of the health department's bureau of preventable diseases. The Kolmer and VDRL tests were done on positive

reactors. If these tests were positive, the person was recalled to the social hygiene clinic for a history and a physical examination as well as a repeat serologic test.

Tubes containing potassium fluoride were used in the blood sugar test. The time of the last meal was obtained. Since the screenings were held in the evening, the tubes were refrigerated overnight and analyzed the following morning in the laboratory of the diabetes detection clinic of the Brownsville Health Center. These criteria, used by the diabetes detection clinic, were followed:

| <i>Hours since last meal</i> | <i>Screening level for blood sugar (mg.)</i> |
|------------------------------|--|
| Less than 2----- | 130 |
| 2 to 3----- | 110 |
| More than 3----- | 100 |
| Not known----- | 130 |

Self-obtained Papanicolaou smears were submitted by the women. These were stained and examined in the cancer detection clinic according to the standard procedure set up by the city's Adult Hygiene Bureau.

Physicians took the blood pressures. We set up this guide for recalls:

| <i>Age of patient</i> | <i>Systolic mm. Hg.</i> | <i>Diastolic mm. Hg.</i> |
|-----------------------|-------------------------|--------------------------|
| Under 30----- | 130 | 90 |
| 30-39----- | 140 | 90 |
| 40-49----- | 150 | 90 |
| 50 or over----- | 150 | 100 |

On recall, persons were retested by physicians in the center's clinics or by the district health officer. When high readings persisted for those with suggestive history or symptoms, the patients were referred to treatment agencies.

For the eye tests, an ophthalmologist was provided to the survey by the glaucoma research division of the New York Association for the Blind. The ophthalmologist used the Berens-Tolman hypertension indicator, which picks up tension of 25 mm. Hg. or more. Individuals with this reading were recalled for a history and referred to a treatment agency. In addition to glaucoma, the ophthalmologist reported a number of other eye conditions which he incidentally diagnosed.

The National Society for Prevention of

Blindness supplied technicians to conduct near vision tests. They used the Lebohnson chart at a distance of 14 inches. Patients with a visual acuity of less than 14/21 with or without their glasses were referred for followup. The technicians also carried out field vision tests using the Harrington-Flocks multiple pattern field screener.

Since our regular health department services supplied most of the staff, all of the supplies, the laboratory work, and the followup and voluntary agencies provided the staff for the eye examinations without charge, the cost of the screening evenings is impossible to estimate with any degree of accuracy.

Survey Findings and Followup

All but 33 of those screened were East Harlem residents. Although the survey was especially scheduled in the evening for the convenience of working people, only 114 of the participants were men. Nearly 70 percent (303) were Puerto Ricans; 7 percent (31) were Negroes.

There was a wide age range, but 354 persons were 20-49 years of age because such a large percentage of the screened population came from the parents' group. Five were under 20, and 10 were 70 or older. During the followup we learned that of the 286 persons who gave data on their incomes, 250 claimed a weekly per capita income of less than \$20. The median, excluding 37 cases on welfare, was \$12.24. The average family had 4 or 5 members.

A relatively high percentage of positive findings were expected in this population, but the results far exceeded expectations (table 1). The survey found 525 defects in 312 of the persons examined. Only 123 were completely negative, and this fact was reported to the screenee's private physician, if he had named one, or the screenee was notified by mail (table 2). Relatively serious defects, previously unknown to the participants, were found in 131 (30 percent) of the screened group (table 3).

None of the 312 found to have one or more defects received this information by mail. The findings were reported to a private physician, if his name had been given, or the person was given an appointment at the health center. If any of the defects fell in the area of any one of the health center services, which include chest,

social hygiene, and cancer detection, the patient was recalled by the clinic, advised about all of the positive findings, and referred for treatment.

Table 1. Defects discovered through multiphasic screening of adults in East Harlem, 1956

| Test | Total persons screened | Num- of persons with accept- able exami- nation or labora- tory speci- men | Num- ber of defects ¹ | Per- cent- age of defects ² |
|---|------------------------|---|--|---|
| Chest X-ray: | | | | |
| Lung..... | 435 | 428 | 10 | 2.3 |
| Heart..... | 435 | 428 | 13 | 3.0 |
| Papanicolaou smear..... | 261 | 212 | 2 | .9 |
| Serology..... | 423 | 420 | 15 | 3.6 |
| Blood sugar..... | 420 | 375 | 50 | 13.3 |
| Nutrition exami- nation (includes obesity)..... | 431 | 431 | 249 | 57.7 |
| Tonometry..... | 186 | 186 | 7 | 3.8 |
| Eye inspection..... | 186 | 186 | 5 | 2.7 |
| Field vision..... | 46 | 46 | 5 | 10.8 |
| Near vision..... | 128 | 128 | 89 | 69.5 |
| Blood pressure..... | 432 | 432 | 80 | 18.5 |
| Total..... | 435 | ----- | 525 | ----- |

¹ Defects were found in 312 persons.

² Percentage of defects compared with number of persons with acceptable examination or laboratory specimen.

Table 2. Persons with no defects found during multiphasic screening of adults in East Harlem, 1956

| Age group (years) | Total num- ber of persons tested | Persons without defects | |
|-------------------|---|----------------------------|---------|
| | | Number | Percent |
| Under 20..... | 5 | 1 | 20 |
| 20-29..... | 100 | 40 | 40 |
| 30-39..... | 142 | 52 | 36 |
| 40-49..... | 112 | 23 | 20 |
| 50-59..... | 33 | 2 | 6 |
| 60-69..... | 32 | 2 | 6 |
| 70 and over..... | 10 | 2 | 20 |
| Not stated..... | 1 | 1 | 100 |
| Total..... | 435 | 123 | 28 |

Table 3. Significant defects, previously unknown, diagnosed for the first time in 131 adults through a multiphasic screening in East Harlem, 1956

| Defect or disease | Total persons screened | Number of persons with acceptable examination or laboratory specimen | Number of defects diagnosed ¹ |
|---|------------------------|--|--|
| Active tuberculosis ² ---- | 435 | 428 | 2 |
| Cardiac abnormality ² (by X-ray)----- | 435 | 428 | 8 |
| Cervical cancer ² ----- | 261 | 212 | 1 |
| Syphilis ² ----- | 423 | 420 | 6 |
| Hyperglycemia----- | 420 | 375 | 38 |
| Nutritional defect (not obesity)----- | 431 | 431 | 41 |
| Field vision defect----- | 46 | 46 | 3 |
| Near vision defect----- | 123 | 123 | 21 |
| Glaucoma----- | 186 | 186 | 5 |
| Other eye condition----- | 186 | 186 | 2 |
| Hypertension----- | 432 | 432 | 46 |
| Total----- | 435 | ----- | 173 |

¹ This does not include persons who needed referral for further treatment for a known pathologic condition such as cancer of the cervix, and who needed further persuasion to accept supervision and care.

² Indicates conditions in which the diagnosis was confirmed on followup. For all other conditions the persons were referred directly to treatment agencies.

Patients whose defects fell in a category for which the health center had no clinic service received an interview with the health officer and conference nurse. Previous knowledge of the condition and treatment status was determined and referral for further followup was made on the basis of need.

On the screening night, only 58 persons gave the name of a private physician to whom we could report the findings. In subsequent interviews of 358 persons during clinic followups or home visits, sometimes both, 117, or one-third, indicated that they had a doctor to whom the family at least occasionally went for treatment. Forty-four percent (156) used 1 of the 3 hospitals in the district, the majority, 117, the municipal hospital; 26 gave the name of a hospital outside of the district; and 59 said the family knew no treatment agency.

Some of the district's difficulties in followup can be gauged from the fact that the mail was returned "not found" for 24 patients. Most of these were traced by 2 medical students who

made home visits in July and August, but 9 were never located. What seems especially remarkable is that, although the patients spent several hours undergoing examination on the survey nights, not more than a handful came in or called up to inquire about the results.

During the summer of 1956, two 3d-year medical students visited the homes of 226 of the individuals who had participated in the program. Thus further information was obtained about the patients' previous awareness of pathology, current treatment status, other illnesses, treatment agencies used, family income, and number in the family. Language difficulties, evasiveness, and sometimes the obvious fact that the person interviewed did not know the answer to a question made some visits unsatisfactory, and we felt that statistical evaluation could not be applied to the answers. Only 125 visits were satisfactory and gave us valuable information otherwise not obtainable.

Summary and Conclusions

In the spring of 1956, three evening multiphasic screening sessions with nine tests available were held in the East Harlem Health Center. Of 435 individuals participating, all but 33 were residents of the district. Only 123 persons did not require recall. A total of 525 defects were found in 312 persons; 131 of these had relatively significant pathology of which they had no prior knowledge.

The findings of this survey suggest the incidence of a high degree of undiagnosed illness in the low-income, adult population of the district. Further investigation is needed to determine the size of the problem in this and other population groups. This type of investigation should be particularly rewarding because so many of the illnesses and defects found in the survey lend themselves to amelioration and cure.

Consideration should be given to the extent and manner in which the community should make available expanded facilities for diagnosis and followup. Perhaps of greatest importance is the need for health education designed to increase the individual's awareness of the existing services and facilities and to raise his standards for positive health.

In a recently established research program, the National Office of Vital Statistics is developing sampling survey methods and conducting studies to collect supplementary data "anchored to vital records."

Expanding and Improving Vital Statistics

MONROE G. SIRKEN, Ph.D., and HALBERT L. DUNN, M.D.

VITAL STATISTICIANS generally think of their program as consisting of two related parts, registration and statistics. Traditionally, "statistics" has meant tabulation of data derived routinely from registration certificates. These tabulations may be considered basic vital statistics. To meet a growing demand for additional data, the concept of vital statistics is being expanded to cover supplementary statistics anchored to the vital records.

The increasing demand for supplementary vital statistics is not difficult to understand. Vital events are crucial in people's lives, and consequently they are central to many other events. Economists, demographers, and social scientists are among the host of nonhealth users of basic and supplementary vital statistics. In public health, the demand for supplementary vital data has been stimulated by the growing concern with chronic diseases, which has created interest in studies that relate the person to his total environment.

The demands for more vital and related statistics presently exceed our ability to supply them. With a few notable exceptions, such as

tabulations of multiple causes of deaths, we have pretty well exploited the items on the vital records. We do not mean to imply that all possible applications are being made of our tabulations of basic vital statistics; this is not the case. We mean merely that there is little possibility of developing tabulations of vital statistics involving new variables from the data now provided on the vital records.

How, then, should we proceed in developing new vital statistics as needs materialize? It is natural to think first of the possibility of adding new items to the vital records, but the prospects here are not encouraging. The records are legal as well as statistical documents; they cannot be encumbered with what the legal mind regards as extraneous. In fact, vital statisticians themselves would be reluctant to add too many new items or certain items. If we should ask the physician, the hospital staff, or the funeral director to provide routinely a lot of supplementary information, the request might endanger the quality of the basic data they are now providing. Furthermore, the possibility of getting more vital data by revising the vital records is not good because our system binds us to infrequent revisions.

Even if we could overcome these difficulties, we would find it inefficient routinely to collect supplementary information on the vital record itself because it is rarely necessary to obtain such information for every vital event, be it birth, death, marriage, or divorce. Because of the sampling errors that can be tolerated,

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the collection of supplementary information can usually be confined to a relatively small subsample of the appropriate events occurring in a specified time period. In most studies, supplementary information is applicable only to a subset of events such as deaths due to selected causes or births of specified weights. Moreover, the information is needed for a single year or less or on a cyclical basis less frequently than annually.

The kinds of supplementary vital statistics that are being requested can be grouped according to their uses into three main categories. One, supplementary vital statistics are of administrative value in planning or evaluating a program, say statistics on the circumstances of fatal accidents in planning an accident prevention program. Two, such data are used in epidemiological studies to search for the etiological determinants of disease; for example, to relate cancer to cigarette smoking or fetal deaths to radiation exposure of the parents. Three, in population studies they are used in combination with information collected from other sources to get an accurate picture of what is going on in the general population. Thus, data on hospital utilization by persons who die during the study period are combined with comparable information collected from household surveys to get unbiased estimates of total hospital utilization for the exposed population.

The foregoing exemplify types of supplementary statistics related primarily to expanding the scope of vital statistics. Another important use of supplementary data is to evaluate and improve the quality of vital statistics. For example, inquiries are being made into the diagnostic evidence on which medical certification of death is based. In another study, the concept of usual place of residence as applied to tabulations of mortality statistics is being evaluated on the basis of supplementary information covering the lifetime residences of the decedent.

Since the lack of knowledge concerning methods of collecting supplementary data is probably the chief deterrent to expansion and improvement of vital statistics, the National Office of Vital Statistics of the Public Health Service has recently initiated research on

sampling survey methods as applied to this field. It is hoped that the continuity of research assured by this new activity will contribute to the development of appropriate methods and stimulate interest in others to do likewise.

Record-Anchored Studies

NOVS feels that studies anchored to the vital records hold the most promise of success in getting the needed supplementary data.

What is meant by "studies anchored to vital records"? These are studies in which the universe is defined by registered vital events. The records of appropriate vital events are the basic units, and supplementary information is collected for a sample of these units. Three main types of studies anchored to vital records are (a) the retrospective, or followback, study, (b) the cohort study, and (c) the record-matching study. In followback and cohort studies, supplementary data are collected by conducting surveys. The followback study is based on information collected in a single survey, whereas the cohort study entails collecting information for an identical set of persons on two or more occasions. In the record-matching study, the death certificate or other vital record of a person is matched with his other records, such as the census enumeration or OASI record.

The record-anchored method of collecting supplementary vital statistics has several good features. First, complete files of vital records are available for the Nation, for each State, and for communities; from these, all cases of rare vital events and probability samples of less unusual events can be readily selected. Second, basic facts concerning the vital event are contained in the vital record and therefore need not be collected again. Third, the established vital statistics system provides an operating organization for conducting these studies.

According to NOVS experience, studies anchored to the vital records are generally problem oriented. The data are usually collected for specific purposes such as estimating the amount and kind of hospital care given to persons during the year before death or testing hypotheses associating respiratory cancer with cigarette smoking. Consequently, the survey design is tailor-made, as are the decisions regard-

ing the size of the sample, the type of questionnaire and kinds of questions, and the sources queried for information. As has been indicated, each of these surveys is usually of short duration. However, the possibility of establishing a continuous sampling procedure for conducting retrospective and cohort studies to collect certain kinds of supplementary information routinely and other kinds on a one-time or cyclical basis deserves consideration.

This brings us to consideration of the question, what are the most efficient ways of conducting the record-anchored studies to collect the needed data? An answer to this question requires consideration of costs and of sampling and response errors associated with collection of the information.

During the past year, NOVS has been developing optimum procedures for conducting retrospective studies anchored to the death certificate. The first methodological study, the Pennsylvania mortality study, tested procedures for collecting supplementary information about decedents by the retrospective method (1).

Data Collection Procedures

The Pennsylvania mortality study was sponsored by NOVS and the National Cancer Institute, Public Health Service, in cooperation with the Pennsylvania Department of Health. Undertaken primarily to determine procedures for conducting retrospective studies of decedents, it also served as a pilot test for an epidemiological lung cancer study in which smoking and residence histories were to be collected retrospectively for a nationwide sample of deaths. Physicians were requested to supply information about the diagnostic procedures on which they had based their certification of the causes of death. Relatives or close friends were asked to supply information about the smoking habits, residence, and job histories of the deceased.

More than 1,700 deaths were selected from those registered with the Pennsylvania Department of Health during May, June, and July 1956. Included were all lung cancer deaths, about 600, occurring during the 3-month period; for these the Pennsylvania Department of

Health provided copies of the death records. The remainder were a sample of the deaths from other causes selected at NOVS from Pennsylvania's monthly shipment of death certificates in the 10 percent current mortality sample. (The current mortality sample is a 10 percent systematic sample of death certificates received each month in the vital statistics offices of the 48 States, the District of Columbia, and 3 independent registration cities—Baltimore, New Orleans, and New York. Each month, the vital statistics offices send copies of the death certificates in the sample to NOVS.)

Collection of data for each death began with a mail query to the funeral director requesting the name and address of the certifying physician or for identification of the family informant if this information was missing, incomplete, or illegible on the death certificate. Next, the medical certifier of each death was sent a query by regular mail. Followup letters by regular and then by certified mail and telephone reminders for nonresponding physicians were the subsequent steps.

The original query to the certifying physician stated that the family informant would be asked for supplementary information about the decedent unless the certifier advised against it. Such advice was given rarely, and relatives or friends of virtually all decedents were queried. The survey of informants was initiated with a regular mail query, and followup actions included both regular and certified mailings. Personal interviews were conducted on a subsample of nonrespondents who lived in standard metropolitan areas.

Unusually high response rates in the Pennsylvania mortality study indicate the feasibility of collecting data by means of retrospective studies anchored to the death records. More than 95 percent of the certifying physicians eventually answered the queries. More than 85 percent of the family informants answered the mail queries, and the response rate was increased to 95 percent by means of the personal interview.

Another phase of the study, not yet completed, consisted of personal interviews with a random subsample of about 300 family informants living in standard metropolitan areas who had answered the mail queries. The purpose of these interviews was to measure the quality of infor-

mation reported by mail by comparing it with responses given in the personal interviews.

Other NOVS Objectives

In addition to the activities related directly to basic methodological research, two other objectives of special interest are included in NOVS's program for supplementing vital statistics. First, NOVS hopes to establish a service to provide technical consulting assistance on these matters to other agencies, including State and local health departments. Second, a survey-operations unit has been established for conducting survey studies to supplement and improve vital statistics. NOVS, in collaboration with other agencies, is currently undertaking one such survey and is planning another for 1958. The first, a joint project with the National Health Survey Program, is an illness study of deceased persons in the Middle Atlantic States. The second, which NOVS is undertaking for the National Cancer Institute, is a national lung cancer mortality study based on lessons learned from the Pennsylvania mortality study.

The national lung cancer study will use for the first time a procedure that may be called dual sampling. Corresponding data will be collected for a sample of vital events and for a sample of the exposed population in order to obtain estimates of vital rates. The national lung cancer mortality study will comprise one phase of a national lung cancer study that includes collecting information on smoking habits and residence history for both a national sample of lung cancer deaths and a sample of the national population. The information for a sample of the national population will be collected by the Bureau of the Census as a supplement to its current population survey. National estimates of lung cancer mortality rates in association with smoking habits and places of lifetime residence will be derived from ratios of the two sets of data.

NOVS will need the assistance and cooperation of State health departments in conducting national studies anchored to the vital records. What we have in mind is the kind of relationship that NOVS had with the Pennsylvania Department of Health in the Pennsylvania mor-

tality study. Most important was the fact that the State health officer endorsed the study. Also important was his assistance and that of his associates in the health department in obtaining the endorsement of the State medical society.

The national lung cancer mortality study will entail following back on a relatively small number of lung cancer deaths selected from the death records sent to NOVS in the 10 percent mortality sample. The study has been endorsed by the Association of State and Territorial Health Officers. However, it cannot be completely successful without the approval of health departments in the 52 independent registration areas in the continental United States. We feel confident of Federal-State cooperation in this study in view of the long-standing cooperative relationships between NOVS and State offices of vital statistics.

Conclusions

At the beginning of this paper, we spoke of three activities of vital statistics programs: registration, production of basic vital statistics, and production of supplementary vital statistics. We believe that there will be a considerable increase in the research use of vital records at the local, State, and national levels, particularly as the records serve as focal points in sample surveys to collect supplementary vital statistics. Consequently, the activities of vital statisticians in this area will increase. It will be important, however, to continue to pay close attention to the other activities as well. Survey studies anchored to vital records may be visualized as the superstructure of the vital statistics system. Registration practices and the compilation of basic statistics are the foundation. Of necessity, the foundation must be kept in good repair in order to serve the needs for continuous series of the basic statistics and to support the supplementary statistics.

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KB cells, easy to obtain and inexpensive to grow in tissue cultures, were used as successfully as monkey kidney cells for the isolation and identification of polioviruses.

Tissue Cultures of KB Epithelial Cells for Poliomyelitis Virus Tests

LAURI LUOTO, D.V.M., M.P.H., and EDGAR G. PICKENS

PUBLIC HEALTH laboratories are often called upon to test various human specimens for polioviruses. A variety of human and monkey cell cultures are employed (1) for this purpose, but their use presents certain limitations for small laboratories operating on limited budgets or those at some distance from biologic supply firms. The use of such cells requires ready access to a source of materials and may prove expensive. The cultivation of certain cells, such as the HeLa cell, by serial passage, has proved troublesome at the Rocky Mountain Laboratory and other laboratories. Utilization of a cell line that can be more easily grown by serial passage, such as the epidermoid carcinoma, strain KB (2), which is susceptible to poliovirus (3), offers advantages of availability, economy, and convenience.

This paper describes a method for growing KB cells serially in tissue cultures and the results obtained in tests for the isolation and identification of polioviruses.

Material and Methods

KB cells grown and maintained as stock cultures in square 16-ounce bottles were transplanted to smaller containers for test purposes. Stock bottles seeded with 3 ml. of a cell suspension (approximately 3,600,000 cells) and 14 ml. of growth medium yielded confluent sheets of closely packed cells suitable for transplant-

ing after 7 days' incubation at 36° C. These cells were trypsinized, centrifuged at 600 rpm for 10 minutes, and resuspended in a volume of medium 8 times that of the original cell inoculum. Thus, each stock bottle yielded 24 ml. (8 x 3 ml.) of transferable cell suspension. For use in tests, 2-ounce prescription bottles were inoculated with 0.5 ml. (600,000 cells) of the cell suspension and 10 ml. of medium. When test tube cultures were prepared, each tube received 1 ml. of the suspension diluted 1:20 in medium (60,000 cells).

Growth medium, 90L, for the KB cells consisted of Scherer's maintenance solution (4) containing 0.5 percent lactalbumin hydrolysate, 10 percent horse serum, and 125 units each of penicillin and streptomycin per milliliter. Cultures were ready for use after 3 days of incubation when bottles contained scattered islands of proliferating cells and tubes contained nearly confluent sheets of cells. Prior to inoculation with test specimens, the growth medium was replaced with medium 95M which consisted of 90L diluted with an equal volume of maintenance solution. To avoid heavy growth and

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consequent overcrowding of cells, test cultures were used within a few days. Stock cultures of KB cells could be stored for several weeks at 28° C.

Cultures also were prepared from trypsinized rhesus monkey kidneys (5). MK cells were planted in 2-ounce or 16-ounce bottles, or in test tubes, in Hanks' solution (6) containing 0.5 percent lactalbumin and 5 percent horse serum. This medium was replaced after 5 days incubation with a similar one containing 5 percent calf serum instead of horse serum, and an additional 20 ml. 4.4 percent NaHCO_3 per liter of medium. Before using the cultures, when grown to yield confluent sheets of cells after 7 to 10 days of incubation, the latter medium was replaced with a similar one containing only 2 percent calf serum but an additional 20 ml. NaHCO_3 .

Prototype and types 1, 2, and 3 polioviruses were titrated in tube cultures of KB and of monkey kidney cells. One-tenth milliliter aliquots of tenfold dilutions of virus were inoculated into 6 tubes per dilution and the cultures were observed for 7 days for virus-induced cytopathogenic changes. Titers of virus obtained with the respective cells were calculated (7) from the highest dilutions which produced cellular changes.

Neutralization tests for identification and typing of polioviruses were performed (5) in both cell cultures with poliomyelitis antisera from hyperimmunized monkeys. Neutralization of virus activity by pooled or by type-specific antiserum within the 4-day observation period was the basis upon which agents were identified as poliovirus or a type thereof.

Isolation of polioviruses from human specimens was attempted with both KB and monkey kidney cell cultures. Human fecal specimens were prepared as 20 percent suspensions in saline and centrifuged at 8,000 rpm for 30 minutes. Supernates, to which 125 units each of penicillin and streptomycin per milliliter had been added, were inoculated in 0.4-ml. amounts onto cultures. Throat washings, collected in 20 ml. of 1 percent bovine albumin in Hanks' solution with antibiotics, were inoculated in 1 ml. amounts. Daily for 7 days, cultures were examined microscopically for cytopathogenic changes; changes observed in

second passage cultures were considered specific. Viruses in such culture fluids were then differentiated in poliomyelitis-neutralization tests. If a discrepancy occurred in the test results between the MK and KB cultures, the test specimens were retested in cultures of both cells. Data on original tests of most specimens on monkey kidney cells were obtained through Dr. Carl L. Larson and William Wicht, Rocky Mountain Laboratory.

Results

Results of titrations of 9 suspensions, representative of 3 types of virus, indicated that both tissue-culture systems were of approximately equal sensitivity for the detection of polioviruses (see table). In tests of virus dilutions

Titers of polioviruses obtained in cultures of MK cells and KB cells

| Poliovirus | Virus titer ¹ | |
|------------------------|--------------------------|-------------|
| | MK cells | KB cells |
| <i>Stock strains</i> | | |
| Type 1: | | |
| Mahoney----- | $10^{-6.6}$ | $10^{-6.6}$ |
| Brunhilde----- | $10^{-6.4}$ | $10^{-6.7}$ |
| Type 2: | | |
| MEF----- | $10^{-6.5}$ | $10^{-6.0}$ |
| Lansing----- | $10^{-6.3}$ | $10^{-6.4}$ |
| Type 3: | | |
| Saukett----- | $10^{-7.0}$ | $10^{-6.4}$ |
| Leon----- | $10^{-6.8}$ | $10^{-6.7}$ |
| <i>Recent isolates</i> | | |
| Type 1: No. 3420----- | $10^{-6.8}$ | $10^{-7.0}$ |
| Type 2: No. 2682----- | $10^{-6.7}$ | $10^{-6.9}$ |
| Type 3: No. 2647----- | $10^{-6.7}$ | $10^{-5.4}$ |

¹ Log of $\text{TCID}_{50}/\text{ml}$.

near the end point, changes were sometimes noted earlier in monkey kidney cells than in KB cells, possibly because the irregular shape of the former cell permitted easier detection of changes. Differences noted were not significant, however, since cellular changes were essentially identical within several days. Alterations induced in KB cultures were similar to the progressive changes observed in monkey kidney cultures. Individual cells rounded into refrac-

tile spheres which detached from the glass surface until the entire culture was destroyed.

Eighteen known polioviruses, 3 prototype and 15 recent isolates, previously identified in monkey kidney cultures as types 1, 2, or 3, were retested in KB cells with type-specific and pooled antisera. In every instance type-specific and pooled antisera caused clear-cut neutralization of virus. Results of these tests were identical with those previously obtained with monkey kidney cultures.

Identification of 80 recently isolated viruses of mixed species was attempted by neutralization tests in which only pooled poliomyelitis antisera were used. Thirteen agents were identified as polioviruses with both MK and KB cells. The remaining 67 viruses were not inactivated by the antisera when tested in either cell type. Apparently KB cells are as effective as monkey kidney cells for identification of polioviruses inasmuch as all 13 known polioviruses and 67 nonpolioviruses, subjected to tests in both cells, were accurately differentiated with KB cultures.

Approximately 300 suspensions of feces or throat washings were tested for the presence of cytopathogenic agents. Viruses were detected in 29 specimens when monkey kidney cells were used and in 62 specimens when KB cells were employed. Of the agents isolated, 22 in monkey kidney cultures and 24 in KB cells were polioviruses. These isolations were made from the same specimens except in the two instances where cytopathogenic effects appeared only in KB cells.

Agents other than polioviruses were detected in 38 specimens tested with KB cultures and in 7 of the same specimens with monkey kidney cells. Thus, the KB cells detected all polioviruses or other viruses that were isolated from human specimens with MK cultures.

Discussion

KB cell cultures used for the isolation or propagation of viruses should consist of a dispersed cell pattern so that cellular changes caused by virus can be detected readily. Cultures containing heavier growth or confluent cells can be used with polioviruses, which produce rapid and complete degeneration of cells.

When viruses that are slow growing or that produce minimal cytopathogenic changes are cultured, the use of confluent cells may result in overcrowding and loss of cell detail, interfering with the detection of changes if tests are to be held longer than a week. Suitable cultures are easily prepared and quickly available if containers are inoculated with appropriate numbers of cells.

The sensitivity of KB cells to polioviruses, as demonstrated in titrations, in neutralization tests, and in isolation of the virus from naturally infected specimens, indicates that this cell may be substituted for or used to supplement MK cultures now used for these purposes. Also, KB cells appear more susceptible than monkey kidney cells to many nonpolioviruses. This observation will be considered fully in another paper.

Summary

Cultures of KB cells were as sensitive as cultures of monkey kidney cells in titrations of 9 suspensions of polioviruses representative of the 3 antigenic types. Eighteen known polioviruses were accurately identified by neutralization tests with KB cells. When 80 unidentified viruses were subjected to neutralization tests with poliomyelitis antisera, 13 polioviruses detected by monkey kidney cells were also identified by KB cells. In tests of 300 human-fecal suspensions or throat washings, 22 polioviruses detected in cultures of MK cells were also isolated in KB cells. Since cultures of KB cells can be propagated serially, they are less expensive and more readily available than monkey kidney cells commonly used for the isolation and identification of polioviruses.

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State Mental Health Legislation in 1957

Broad expansion of community mental health services took place during 1957 as a result of the large volume of State legislation aimed at stimulating mental health programs in the communities and at improving conditions for the mentally ill.

During that year, according to reports received by the National Institute of Mental Health, Public Health Service, California, Minnesota, New Jersey, and Vermont passed laws providing grants-in-aid for community mental health services. Such legislation had been passed by Connecticut, New York, Pennsylvania, Indiana, Tennessee, and Florida in previous years.

Laws authorizing counties to levy taxes or to appropriate funds to support local mental health centers were passed by Iowa, Kansas, and South Dakota in 1957.

States and Territories which took steps to modernize laws governing commitment, detention, care, and treatment of the mentally ill were California, Colorado, Kansas, Minnesota, Montana, North Dakota, Texas, and Alaska.

Legislative action in Connecticut, Maine, Minnesota, New Hampshire, Oregon, Rhode Island, and West Virginia ratified the Interstate Compact on Mental Health, already subscribed to by Massachusetts, New York, and New Jersey. For care and treatment of the mentally retarded, Arkansas, Nebraska, and Texas authorized the construction of new institutions, the State of Washington set up a diagnostic and training center, and New York is planning a research institution. Idaho and Minnesota made it mandatory for local school districts to provide instruction for such handicapped children.

In Washington, a resident treatment center for emotionally disturbed children is being set up for research and treatment and a center for such children has also been authorized in Minnesota.

For juvenile delinquents, a special program of intensive treatment in California is being initiated in two institutions of that State. Among the States taking action to expand research and training were Texas, North Dakota, Iowa, and Ohio, where a research program in alcoholism was set up at the College of Medicine of the Ohio State University.

National Food Conference

Neglect of breakfast was observed to be the main cause of poor nutrition by several speakers at the National Food Conference in Washington, D. C., on February 24, 1958. Fears and discomfort were also discussed as major causes of poor feeding habits.

Almost every age group and both sexes consume inadequate amounts of nutrients, several of the speakers stated. High on the list of ill-fed, however, were teen-age girls and women 30 years of age or older, including many who fear the cosmetic effects of fat.

Adelia M. Beeuwkes, associate professor of public health nutrition at the University of Michigan, pointed out that teen-agers in every section of the country are failing to eat all the nutrients recommended for good health. She said there is a vital need for a nutrition education foundation in order that industry can present to the public a coordinated effort relating to all the foods necessary for normal nutrition.

Elmo Roper, market research consultant, observing the same conditions as Professor Beeuwkes, said that a large number of teen-age girls, apparently emulating their mothers, either skip breakfast or fail to eat a balanced one. "Part of the answer," Roper said, "lies in fear of weight. Part seems to lie in circumstances surrounding the eating of breakfast. Eating alone, eating in a hurry, a poor night's sleep, for example, all work against eating a good breakfast."

The older females get, the more they lean to poor diets, observed James H. Hilton, president of Iowa State College. Only 27 percent of girls 6-8 years old do not have a proper diet, but 89 percent of women 30 years old and older are not eating well.

Referring to a study of 681,000 women in Iowa who were 30 years old or older, Hilton said that "the diets of one-half to two-thirds of the

women were lacking in calcium, ascorbic acid, or vitamin A. About one-third of the diets were deficient in protein."

Deficiencies of this kind in the diet, Hilton added, might account, at least in part, for such things as fatigue and emotional instability of which the women in the study complained.

Roper provided additional information on women between 21 and 30 years of age. In a survey, a sample of these young women were asked to list everything they had eaten in one day. Their answers were classified according to the Department of Agriculture's basic 7 groupings. Only 3 percent of the women met the recommended requirements.

Hilton and Roper were in accord that the public must be educated in good eating habits rather than in the nutritive values of food. The failure in this country, Roper said, is not the supply of proper foods or the money to buy them. Nor is the public "unsympathetic to the objectives of proper eating." The public has simply failed to act upon its knowledge.

Hilton and Roper also emphasized the importance of continuing nutritional research. The effects of the working mother on the family diet, the uncongeniality and hastiness of meal-times, and the rapid changes in the preparation of food must be taken into account, Hilton said, along with the "ethnic, environmental, economic, and social origin of the people," in nutritional research.

Miriam E. Lowenberg, head of the foods and nutrition department of Pennsylvania State University, observed that children can be fed better and more wisely if they are viewed as individuals with certain capacities and preferences.

Practical considerations, she said, should guide us in the proper feeding of children. Some of the considerations she discussed were:

A 2-year-old child is able to eat approximately two tablespoonfuls of most vegetables and meat and twice that amount of soup or dessert. One should therefore avoid giving him adult portions.

If a child is served less food than he can actually eat, he feels successful when he has eaten everything set before him and he may even ask for more.

Mothers should select food that youngsters can pick up. They should allow children to eat with their fingers, she said, so that the child need not feel insecure because of awkwardness with fork and spoon.

Children prefer simple dishes and mild flavors, Dr. Lowenberg added. They have no desire to try new foods or strong seasonings.

Children 2 to 6 years old are sensitive to the texture of foods, prefer crispy foods, such as raw vegetables. They seem to enjoy the noise of chewing, she said. They dislike gummy textures or very dry food. Children under 7 do not particularly enjoy food that they have to slice, for they cannot easily use the knife.

If practical considerations are followed, Lowenberg concluded, satisfying eating habits can be instilled in the healthy child.

films

Aedes aegypti Survey Techniques

35-mm. slide film, color, silent, 82 frames, 1957.

Audience: State, county, and local mosquito control personnel.

This film documents techniques and procedures used in a population survey of *Aedes aegypti*, vector of yellow fever and dengue.

The frames show (a) orientation and briefing of mosquito control personnel before the survey; (b) selec-



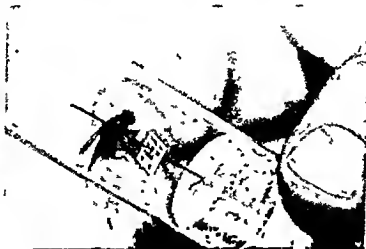
tion of areas to be sampled; (c) types of equipment used; (d) various habitats of the mosquito; and (e) larvae sampling and methods of collecting adult mosquitoes.

The print may be obtained on short-term loan (United States only) from the Communicable Disease Center, Public Health Service, 50 7th Street NE., Atlanta 5, Ga., or by purchase from United World Films, Inc., 1445 Park Avenue, New York 20, N. Y.

Collection and Shipment Of Insects

35-mm. filmstrip, color, sound, 9½ minutes, 70 frames, 1957.

Audience: Students of biology, sanitarians, and pest control operators.



This filmstrip shows the correct methods of collecting, preserving, and shipping insects and certain other arthropods to be identified by specialists. These techniques include methods of pinning and labeling, with pertinent data, and packing for shipment.

The film is available on short-term loan, United States only, from the

Communicable Disease Center, Public Health Service, 50 7th Street, NE., Atlanta 5, Ga., and by purchase from United World Films, Inc., 1445 Park Avenue, New York 20, N. Y.

Engineering Your Health

16-mm. film, color, sound, 13½ minutes, 1958.

Audience: Freshman and sophomore college students, junior and senior high school students, science teachers, vocational guidance counselors, PTA groups, civic clubs, and television viewers.

Looking forward to emerging and expanding responsibilities, this film describes the problems, the needs, and the research and operational aspects of the Division of Sanitary Engineering Services programs in water pollution control and water resources, atmospheric pollution research, and radiological health. Also included are references to the various pursuits in sanitary engineering—teaching, travel, research, operations, and so forth.

The film is available from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D. C.; the Film Library, Communicable Disease Center, Public Health Service, 50 7th Street NE., Atlanta 5, Ga.; or engineers in the Department of Health, Education, and Welfare regional offices.

Systematic collection of epidemiological data on suicides may help in understanding the causes of suicide. The study also concludes that the family physician is in a key position to recognize the potential suicide and refer him to psychiatric resources as a hygienic precaution.

Study of Suicide in Philadelphia

JACOB TUCKMAN, Ph.D., and MARTHA LAVELL, M.S.S.

SUICIDE is an important and pressing problem. The figure of 141 suicides reported in Philadelphia in 1955 is not substantially lower than the 176 automobile fatalities in the same period. The importance is not lessened by the fact that there has been a downward trend in suicide since 1900, when the rate of suicide in Philadelphia was 11.3 per 100,000. In 1955 it was 7.2 per 100,000. In general, the 1900-55 trend in Philadelphia parallels that for the United States during the same timespan.

In cooperation with the office of the medical examiner, the division of mental health of the Philadelphia Department of Public Health conducted a study of suicides that occurred in Philadelphia during the 5-year period 1951-55. The purposes of the study were (a) to learn more about the characteristics of individuals who commit suicide, (b) to determine what data should be gathered routinely to obtain a better understanding of the suicide, and (c) to determine ways in which a public health agency might be instrumental in the prevention of suicide.

Data on the suicides were obtained from the records in the office of the medical examiner. The records included information obtained by police who questioned immediate members of

the family, relatives, neighbors, landlords, and occasionally the family doctor at the time of the suicide. Additional facts had been obtained from the person who identified the body at the morgue. When members of the immediate family were too upset to perform this task, a more distant relative or friend less emotionally involved was substituted. In some cases information had been obtained at a formal inquest. Since the data were gathered from many different sources, it is understandable why the records showed considerable variation in the amount of information. When the suicide was a single person without relatives the information was sketchy.

Very little knowledge of the dynamics in the suicide was obtainable from the records, but some inferences about contributory factors and motivation can be drawn. Extreme caution, however, should be exercised in the interpretation of such data because the information may be unreliable and because factors found to be associated with suicide may not be causally connected.

Classification of Suicides

In Philadelphia, during the 5-year period 1951-55, 742 deaths were classified as suicides by the office of the medical examiner. Of these, 555, or 75 percent, were men and 187, or 25 percent, were women. For whites, the sex ratio was 74 percent men and 26 percent women; for

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the nonwhites, it was 83 percent men and 17 percent women. Because of the small number, the 12 nonwhite women in this study are not analyzed separately.

Ten percent of the suicides were nonwhite, whereas in the Philadelphia general population aged 15 years and older in 1950, 17 percent were nonwhite. The under-representation of nonwhites among suicides in Philadelphia follows the national pattern (1).

Of the total group, 90 percent were residents of Philadelphia, 9 percent were nonresidents, and about 1 percent were persons whose residence was not determinable.

Using the average estimated health district population during the 1951-55 period as a base, and the residential address of each suicide, rates were calculated for the 10 health districts into which the city is divided. The rates varied from 5.1 to 9.0 per 100,000 population in the various health districts. The highest rate was found for the center-city district, which includes cheap hotels, rooming houses, and "skid row." This finding agrees with those in studies in Chicago (2, 3), in Minneapolis (4), in Seattle (5), and in Providence (6) that suicide is more prevalent in socially disorganized parts of the city.

The data, however, do not support the conclusion of the Minneapolis study that the suicide rate decreases in direct proportion to the number of miles from the center of the city. Actually, it is most difficult to make any generalizations about the distribution of suicides among the health districts because of (a) the lack of accurate population statistics within each health district, (b) the shifting of population from one health district to another, and (c) the number of factors associated with suicide, such as sex, race, age, and marital status. At best the data suggest that the suicide rate varies less than the incidence of mental disorder from one health district to another (7).

Philadelphia's suicide rate of 7.2 is lower than the national rate, which was 10.1 in 1953, the latest year for which statistics are available (1).

The Philadelphia rate is also lower than that of other large cities. For example, in Detroit (8) and in Baltimore (9) the suicide rates in 1955 were 9.8 and 10.0. In Cleveland (10) the

Table 1. Suicide rate¹ per 100,000 population, by age, sex, and race, Philadelphia, 1951-55

| Age group | White | | Nonwhite | | Total group |
|-----------------------------|-------|----------|----------|----------|-------------|
| | Males | Fe-males | Males | Fe-males | |
| 75 and over..... | 47.1 | 7.7 | 10.8 | 0 | 21.7 |
| 65-74..... | 35.2 | 9.2 | 20.7 | 3.0 | 19.9 |
| 55-64..... | 35.8 | 7.4 | 14.7 | 1.6 | 19.7 |
| 45-54..... | 16.5 | 6.6 | 4.2 | 1.7 | 9.9 |
| 35-44..... | 9.4 | 6.2 | 10.4 | 1.8 | 7.3 |
| 25-34..... | 6.7 | 2.8 | 13.1 | 1.0 | 5.0 |
| 15-24..... | 2.9 | 0.7 | 1.6 | 1.9 | 1.8 |
| Total rate ² ... | 12.1 | 4.0 | 6.6 | 1.2 | 7.2 |

¹ Rates calculated by dividing the total number of suicides in each age group in the 5-year period by the appropriate 1950 census figures multiplied by 5.

² Does not take into account the age-specific rate for each group.

suicide rate for 1953-54 was 12.8. For Cleveland and Baltimore, rates were 14.4 and 11.8 for whites, and 5.7 and 5.3 for nonwhites. The Philadelphia rates for the 1951-55 period were 7.9 for whites and 3.7 for nonwhites.

The lower rates in Philadelphia are difficult to explain. Presumably, the pressures of day-to-day living are no less in Philadelphia. It may be that the differences between the local rate and rates elsewhere in the country are a function of the adequacy of the reporting of suicides in Philadelphia. The medical examiner indicates a possibility that Philadelphia's suicide rate during the years in question may have been spuriously low. With the present improved laboratory facilities and more thorough investigation, the number of deaths classified as suicides may be expected to increase.

Age and Marital Status

The age of the suicides ranged from 15 to 94. There were significant (.01 level) sex and race differences. Among whites, 76 percent of the men were over 45 years of age compared with 63 percent of the women. Among males, the majority of nonwhites were under the age of 45; while the majority of whites were above the age of 45. The median age was 57.5 for white males, 51.1 for white females, and 38.0 for nonwhite males.

Age-specific rates, given in table 1, show a clear tendency for suicide rate to increase with age. There are, however, important differences between whites and nonwhites and between men and women. For whites, the increase of suicide rate with age is clear and is somewhat more pronounced for men than for women. These age differences generally agree with suicide rates for the country as a whole although the national rate for white women most frequently reaches a peak between the ages 55-64 and then decreases (1).

For nonwhite men, the suicide rate does not increase consistently with age. This may be a function of the small number of cases in the sample. It is clear, however, that the rate is highest for nonwhite males in the 65 years of age and older category.

Information on marital status, presented in table 2, was available in nearly all cases. It can be seen that nonwhites had a higher proportion of separated or divorced (23 percent) than the whites (13 percent), fewer widowed (4 percent) than the whites (17 percent), and more single persons (27 percent) than the whites (19 percent). The significant difference in marital status between whites and nonwhites may be, in part, due to differences in age. Since the nonwhites were a younger group, one would expect a lower incidence of widowed among them than among the whites. However, the differences between the two groups in the proportion of separated or divorced cannot be attributed to differences in age.

The marital status of the suicides was different from that of the general population in

Table 2. Marital status of suicides, by race and sex (in percentages), Philadelphia, 1951-55

| Marital status | White | | Nonwhite | | Total group (N=742) |
|---------------------------------|------------------|-------------------------|-----------------|------------------------|------------------------|
| | Males (N=496) | Fe- males (N=175) | Males (N=59) | Fe- males (N=12) | |
| Single..... | 20 | 17 | 27 | 25 | 20 |
| Married..... | 49 | 47 | 42 | 67 | 48 |
| Widowed..... | 16 | 22 | 3 | 8 | 16 |
| Divorced or sep- arated..... | 14 | 13 | 27 | 0 | 14 |
| Not stated..... | 2 | 1 | 0 | 0 | 2 |

Philadelphia (1950 census). Comparisons were made between the suicides and the general population for those between the ages of 25 and 44 and those 45 years of age and older. No comparisons were made for the group under 25 years of age because there were only 26 suicides in this age category.

Among the suicides, there was a higher incidence of single, widowed, and separated or divorced persons than in the general population. The difference between the suicides and the general population was evident for both men and women and for whites and nonwhites in the two age groups. Of the white men aged 25 to 44, 30 percent of the suicides were single compared with 20 percent of the general population; 23 percent of the suicides were separated or divorced compared with 4 percent of the general population. For white women and nonwhite men, the differences between the suicides and the general population were similar.

For the age group 45 and over, the differences between the suicides and the general population were less marked with respect to single, and separated and divorced persons, but were in the same direction. As may be expected, a larger proportion of people in this age category were widowed than in younger age groups. For white men and women, but not for nonwhite men, the incidence of widowed was greater for the suicides than for the general population.

Nativity and Employment

Data on nativity indicated that 25 percent of the entire group was foreign born: 7 percent of the nonwhites and 27 percent of the whites. This is considerably higher than the 1950 census figures for Philadelphia, which show only 11 percent foreign born. This difference is more apparent than real and is due to the higher incidence of older people among the suicides than in the general population. When corrections are made for age, the difference between the incidence of foreign born among the suicides and in the general population disappears (table 3).

Data with respect to employment, physical and mental health, medical supervision, history of alcoholism, history of previous attempts or

Table 3. Percentage of foreign born among white¹ suicides and in the general white population, by age, Philadelphia, 1951-55

| Age of foreign born | Suicides | General population ² |
|--------------------------|----------|---------------------------------|
| 65 and over----- | 44 | 40 |
| 45-64----- | 30 | 31 |
| 25-44----- | 8 | 7 |
| 15-24 ³ ----- | 10 | 2 |

¹ Too few of the nonwhites were foreign born to permit a comparison of them with the general population.

² 1950 census.

³ Number of suicides in age group=21.

Table 4. Employment status¹ of suicides, by race and sex (in percentages), Philadelphia, 1951-55

| Employment status | White | | Nonwhite | | Total group (N=623) |
|-------------------|---------------|----------------|--------------|---------------|---------------------|
| | Males (N=489) | Females (N=69) | Males (N=59) | Females (N=6) | |
| Employed----- | 35 | 39 | 31 | 17 | 35 |
| Unemployed----- | 26 | 25 | 25 | 0 | 26 |
| Retired----- | 14 | 4 | 3 | 0 | 12 |
| Not stated----- | 25 | 32 | 41 | 83 | 28 |

¹ Excluding housewives and students.

threats, and reported causes, are given for the total group only. Because of the high proportion of cases in which no information was available for these factors, it was not possible to make valid comparisons by race and sex.

Twenty-six percent of the suicides (table 4) were reported to have been unemployed. In half of the unemployed cases, poor physical or mental health was given as the reason for unemployment; in only 3 percent of the cases, seasonal opportunities for work or poor performances on the job were given as reasons, and in the balance of the cases the reason was not stated.

A breakdown by age groups shows very little variation in the percentage of individuals unemployed. The percentages vary from 23 percent of those in the age group 25-44 years to 28 percent of those in the age group 45-64 years. Of those in the 65 and older age category, 23 percent were reported to have been unemployed

and 39 percent retired. For those below the age of 65, the incidence of unemployment is considerably greater than that found in the general population of Philadelphia, and even this is an underestimation since no information was available on employment for about 30 percent of the cases. For those 65 and older, the percentage unemployed or retired is about the same as in the general population in this age category, but information was lacking in 23 percent of these cases.

Physical and Mental Health

Reports of physical health (table 5) had been obtained from a number of different sources, usually from immediate members of the family and other relatives, from friends and neighbors, and occasionally from the family physician. Of the entire group 43 percent were reported to have been in poor health. Good health was reported in only 8 percent of the cases. In 48 percent of the cases no information was available about health status.

Information varied regarding mental illness (table 6). In some cases, the record referred to the fact that the deceased had been suffering from a nervous or mental condition without specifying symptoms. In others a nervous or mental condition was mentioned, together with specific symptoms indicating disturbance in mood, feelings, or behavior. These were primarily described as depressed states, but also as morose, brooding, agitated, upset, worried, confused, queer, acting odd, or remote. In still others the record made no mention of nervous or mental condition but did contain a de-

Table 5. Physical health of suicides as reported by relatives and friends, by race and sex (in percentages), Philadelphia, 1951-55

| Health | White | | Nonwhite | | Total group (N=742) |
|-----------------|---------------|-----------------|--------------|----------------|---------------------|
| | Males (N=496) | Females (N=175) | Males (N=59) | Females (N=12) | |
| Good----- | 8 | 9 | 10 | 8 | 8 |
| Ill----- | 47 | 39 | 29 | 25 | 43 |
| Not stated----- | 45 | 53 | 61 | 67 | 48 |

Table 6. Reported mental condition of suicides, by race and sex (in percentages), Philadelphia, 1951-55

| Mental condition | White | | Nonwhite | | Total group (N=742) |
|--------------------------------|---------------|-----------------|--------------|----------------|---------------------|
| | Males (N=496) | Females (N=175) | Males (N=59) | Females (N=12) | |
| Presumably normal----- | 4 | 3 | 0 | 0 | 4 |
| Nervous or mental condition--- | 27 | 55 | 19 | 33 | 33 |
| Mood or behavioral symptoms--- | 39 | 29 | 24 | 17 | 35 |
| Not stated----- | 30 | 13 | 57 | 50 | 28 |

scription of mood, feelings, or behavior. For two-thirds of those suffering from a nervous or mental condition, but for only 3 percent of those with disturbances of mood and/or behavior, a history of nervous or mental condition was also reported.

Of the total group, 10 percent were reported to have had a history of alcoholism. This incidence may be an underestimation since information was not available for 90 percent of the cases. Nevertheless, the incidence of alcoholism among the suicides is considerably greater than that found among the general population, which has been calculated to be 4 percent by the alcoholism unit of Philadelphia General Hospital on the basis of the Jellinek formula.

Receiving Medical Care

In the case of persons who had been under medical care (table 7), the majority of the records gave the name of the physician and usually indicated whether the suicide had been under general medical supervision or under psychiatric care. When there was any doubt, the name of the physician was checked in the county medical society directory. In the other cases, the record merely stated that the deceased had been going to a doctor. In these cases it was not possible to determine the kind of medical care the deceased had received. As would be expected, there was a higher proportion under medical care (77 percent) among those for whom poor physical or mental health was reported.

Of the entire group, 13 percent were reported to have threatened suicide and an additional 9 percent had made one or more attempts. For 3 percent of the cases both previous attempts and threats were reported. Twenty-five percent incidence of either threats or attempts is probably an underestimation, since three-fourths of the records had no information on this point and in some cases threats were implied: "said he would be better off dead," "several times had said she wanted to die," "told wife he had nothing to live for and would be better off dead."

Causes of Suicide

The reported causes for the suicide, or unusual circumstances preceding the death, varied considerably. The causes, and the percent reporting these causes, are presented in table 8.

It is interesting to note that, although two-fifths of the suicides had been reported by relatives and friends to have been in poor physical health, it was given as the cause for suicide by only 18 percent. A similar discrepancy exists for mental disorders. However, it is possible that mental disorders may have been implicit in reasons classified under other categories: disturbed over the death of a relative, depressed, or very much upset when the spouse left him.

Although it is not valid to treat the data statistically because no information is available in nearly half of the cases, the findings suggest that age may be a factor in the causes or un-

Table 7. Medical care and supervision of suicides, by race and sex (in percentages), Philadelphia, 1951-55

| Type of care | White | | Nonwhite | | Total group (N=742) |
|------------------------------------|---------------|-----------------|--------------|----------------|---------------------|
| | Males (N=496) | Females (N=175) | Males (N=59) | Females (N=12) | |
| Medical----- | 29 | 41 | 8 | 8 | 30 |
| Psychiatric----- | 5 | 9 | 0 | 8 | 6 |
| Type not specified--- | 14 | 22 | 19 | 25 | 16 |
| None----- | 6 | 7 | 7 | 17 | 6 |
| Not stated whether under care----- | 46 | 21 | 66 | 42 | 41 |

Table 8. Reported causes or unusual circumstances in suicides, Philadelphia, 1951-55

| Causes | Example | Per- cent of sui- cides ¹ |
|--|-------------------------------|--|
| Physical illness..... | Chronic illness..... | 18 |
| Mental disorders..... | Depression..... | 12 |
| Death or illness of rela- tives..... | Spouse died..... | 8 |
| Financial and job diffi- culties..... | Laid off from job..... | 7 |
| Disturbed family relation- ships..... | Wife left him..... | 5 |
| Police or court action..... | Awaiting trial..... | 4 |
| Violence including threats..... | Murdered wife..... | 4 |
| Changed environment..... | Immigrated to city..... | 2 |
| Unhappy love affair..... | Jilted by girl friend..... | 1 |
| Miscellaneous..... | Suicide pact..... | 1 |
| None stated..... | | 44 |

¹ In about 5 percent of the suicides, more than one reason was given.

usual circumstances preceding the suicide. For those 45 years and older physical illness was reported as the cause in 25 percent of the cases compared with 3 percent for those under 45; while mental illness was mentioned as the cause in 9 percent of those 45 and older compared with 19 percent of those under 45. Disturbed family relationships were given as the cause for 13 percent of those under 45 compared with 2 percent of those 45 and older. Violence also seemed to be operating more in the younger group (10 percent compared with 2 percent of those 45 and older).

Method of Suicide

The method of suicide most frequently used was hanging, usually by rope (table 9). Firearms was second, and poison was third. Poisons included household drugs and chemicals such as barbiturates, aspirin, and morphine, and lye, ammonia, phenol, turpentine, and arsenic.

There was a significant sex difference with respect to the methods employed. Women were more likely to use poison and gas and less likely to use firearms than men. No significant race differences were found in method of suicide but age was a factor for men. Forty-two percent

of the men aged 45 and older used hanging compared with 32 percent of those under 45; while 22 percent of those under 45 used poison and gas compared with 13 percent over 45.

Place of Suicide

The majority of the suicides took place in the home of the deceased (table 10). Twenty percent occurred on the street and in other public places. Women were more likely to commit suicide in their own homes and less likely to do so on the street and other public places. Of those suicides that occurred in the home, the bedroom and cellar were the preferred places. Each of these was chosen in about one-third of the cases. The kitchen and bathroom were each used by about 10 percent of the cases.

Twenty-four percent of the entire group left one or more suicide notes. A comparison of those who left notes with those who did not shows no significant differences with respect to sex, age, race, or marital status.

There was a significant difference, however, in regard to the method of suicide. Poison was used by 18 percent of those who left notes, but by 8 percent of those who did not leave notes. Firearms were used by 29 percent of those who left notes, but by 19 percent of those who did not. By contrast, hanging was the method used by 40 percent of those who did not leave notes, but by 31 percent of those who did.

No relationship was found between suicide

Table 9. Method of suicide, by race and sex (in percentages), Philadelphia, 1951-55

| Method | White | | Nonwhite | | Total group (N= 742) |
|--------------------------------|----------------------|-----------------------------|---------------------|----------------------------|-------------------------------|
| | Males (N= 496) | Fe- males (N= 175) | Males (N= 59) | Fe- males (N= 12) | |
| Hanging..... | 41 | 34 | 27 | 33 | 38 |
| Firearms..... | 26 | 8 | 22 | 25 | 21 |
| Jumping..... | 8 | 14 | 14 | 17 | 10 |
| Cutting or pierc- ing..... | 6 | 2 | 5 | 8 | 5 |
| Poison..... | 7 | 22 | 9 | 17 | 11 |
| Gas, carbon mon- oxide..... | 9 | 14 | 10 | 0 | 10 |
| Drowning..... | 2 | 2 | 14 | 0 | 3 |
| Other..... | 2 | 3 | 0 | 0 | 2 |

Table 10. Place of suicide, by race and sex (in percentages), Philadelphia, 1951-55

| Place | White | | Nonwhite | | Total group (N=742) |
|-----------------------|------------------|--------------------|-----------------|-------------------|------------------------|
| | Males (N=496) | Females (N=175) | Males (N=59) | Females (N=12) | |
| Home..... | 66 | 80 | 51 | 83 | 68 |
| Business..... | 5 | 1 | 2 | 0 | 4 |
| Hospital..... | 5 | 5 | 2 | 0 | 4 |
| Relative's house..... | 2 | 2 | 3 | 0 | 2 |
| Prison..... | 2 | 0 | 7 | 0 | 2 |
| Other..... | 21 | 12 | 36 | 17 | 20 |
| Not stated..... | 0 | 1 | 0 | 0 | (¹) |

¹ Less than 0.5 percent.

and day of the week, month of the year, day of the lunar month, or season of the year. Certain times of the day are preferred to others, but the findings should be interpreted with considerable caution since information was available for only 38 percent of the cases. Of these, one-fifth occurred between 9 a. m. and 12 noon, one-sixth between noon and 3 p. m., and another one-sixth between 6 a. m. and 9 a. m. Only one-tenth occurred between midnight and 6 in the morning.

Discussion

This study, like other epidemiological studies of suicide, is limited because of the inadequacies of medicolegal records. Coroners, of necessity, gather information to establish the cause of death rather than to understand the suicide. If more significant insights and knowledge about suicide are to be developed, systematic information needs to be gathered at the time of death. Such information about the suicide should include his developmental background, extent of education, stability of employment, income, health, history of previous psychiatric hospitalization including diagnosis of mental disorder, interpersonal relationships, pattern of adjustment, temperament, interests, stress situations, and whatever other factors that may be deemed important. Such information should

be obtained not only from members of the family, relatives, and friends but also from more objective collateral sources, such as the family doctor and employer, and through search of court, hospital, and social agency records.

The important finding of this study was that the majority of the suicides had been under medical supervision prior to their death, usually by the family doctor. This suggests that the family doctor is in a key position to recognize psychiatric problems in his patients at the earliest possible time and to refer them to appropriate psychiatric resources for special care and treatment. It would be helpful if material on the problem of suicide, with emphasis on methods of detecting individuals with suicidal tendencies, were introduced in the medical school curriculum.

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Durations of Illness Among Personnel of the Air Force

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MILITARY medical records maintained for the care of the patient are a unique source of data relative to durations of illness. In the Armed Forces, excusal from duty because of illness and subsequent return to duty require the approval of a physician and the preparation of a medical record. Each record shows the diagnosis made by the physician and the total time lost from duty, whether the person was treated in a hospital or in an infirmary, and whether he was in quarters or on sick leave. These data, therefore, are more extensive than those in which only the hospital phase of an illness is recorded, and at the same time they are more reliable than those in which an individual reports his own illness.

A medical record is prepared for each admission, which constitutes enrolling as a patient, a military person whose treatment requires that he be excused from duty beyond midnight of the day on which he reported for treatment. The day of admission is a day of illness; the day of discharge is a day of duty. By definition, therefore, a minimum of 1 day is counted for each admission. Convalescent leave is included in time lost for those patients who must return from such leave for further care and treatment. Convalescent leave granted patients who will return to duty upon expiration of such leave is not included.

The duration of illness, for purposes of this

discussion, refers to total time in an excused-from-duty status during one continuous episode of illness. Included in this study are only those cases returned to duty in 1954, regardless of when admitted. Excluded are fatal cases and those terminated by separation from the service for physical disability. (Return to duty is effected for 98 percent of the patients admitted.)

Table 1 shows selected measures related to the distribution of days lost by 24,508 cases of illness. The mean duration per illness was 12 days. This measure is, of course, influenced by the prolonged duration of relatively few cases. The fact that 75 percent of the cases returned to duty within 10 days (conversely, 25 percent remained 10 days or longer) shows that most Air Force illnesses are of a very short duration. This is to be expected since illnesses of a chronic or prolonged nature are likely to result in disability separation, infrequent in the Air Force population, and not included in this study.

Illnesses of a minor nature may be recorded as excused-from-duty cases for some military persons because domiciliary care (provision of meals in barracks) is normally not available. Also, the same individual may be included more than once either for separate initial occurrences of a given condition or for a recurrent attack of the same condition. A balancing factor, however, is that short-term illnesses treated on an outpatient basis are not included in this study.

Time lost because of a given condition can be discussed adequately only when that condi-

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tion is reported as the sole cause of admission. A single diagnosis is rendered for most illnesses (90 percent) reported among Air Force personnel. Durations of illnesses for multiple diagnosis cases are difficult to interpret because of the different accompanying diagnosis which may or may not prolong the time assigned to the primary cause of illness. Consequently, consideration is focused here on those cases in

which only one diagnosis was reported and which occurred in large enough numbers for meaningful analysis.

Table 2 and figures 1 through 14 pertain to single diagnosis illnesses which resulted in return to duty in 1954. In comparing the shapes of these distributions, it should be observed that two different scales have been used along the abscissa—a 1-day interval or a 10-day interval,

Table 1. Duration of illness among patients returned to duty, U. S. Air Force, 1954

| Cases | Number of illnesses ¹ | Mean days lost | Range of reliability of mean days lost ² | Day after admission on which specified percentage of cases remained | | |
|-------------------------|----------------------------------|----------------|---|---|------------|------------|
| | | | | 50 percent ³ | 25 percent | 10 percent |
| Total..... | 24, 508 | 12. 0 | 11. 7-12. 3 | 5th | 10th | 25th |
| Single diagnosis..... | 22, 018 | 10. 2 | 9. 9-10. 4 | 5th | 9th | 21st |
| Multiple diagnosis..... | 2, 490 | 28. 2 | 26. 0-30. 5 | 11th | 28th | 65th |

¹ In a random 10 percent sample of Air Force personnel.

² ± 2 standard errors.

³ Median day.

Table 2. Duration of illness for specified diagnostic conditions, patients returned to duty, U. S. Air Force, 1954 ¹

| Diagnosis | Number of cases in 10 percent sample | Mean number of days lost | Range of reliability of mean days lost ² | Day after admission on which the specified percentage of cases remained | | |
|--|--------------------------------------|--------------------------|---|---|------------|------------|
| | | | | 50 percent ³ | 25 percent | 10 percent |
| Common cold (47000)..... | 1, 553 | 3. 5 | 3. 4-3. 7 | 3d | 5th | 6th |
| Streptococcal sore throat (051)..... | 543 | 5. 3 | 5. 1-5. 5 | 5th | 6th | 7th |
| Anxiety reaction (310)..... | 149 | 11. 5 | 8. 1-14. 9 | 5th | 9th | 25th |
| Tonsillitis, chronic, with tonsillectomy or adenoidectomy (51013)..... | 224 | 7. 6 | 7. 1-8. 2 | 7th | 9th | 12th |
| Fracture of radius or ulna or both (813)..... | 47 | 21. 7 | 7. 6-35. 8 | 8th | 21st | 53d |
| Appendicitis, acute, uncomplicated (55000)..... | 323 | 11. 6 | 10. 9-12. 3 | 9th | 14th | 20th |
| Mumps (089)..... | 142 | 11. 2 | 10. 4-12. 1 | 10th | 14th | 17th |
| Pneumonia, primary atypical (49200)..... | 235 | 13. 4 | 12. 0-14. 9 | 10th | 17th | 24th |
| Hernia, inguinal, indirect (56001)..... | 199 | 14. 9 | 13. 7-16. 2 | 13th | 19th | 26th |
| Arthritis, all forms (720-725)..... | 103 | 28. 5 | 20. 9-36. 0 | 13th | 35th | 84th |
| Fracture of tibia or fibula or both (823)..... | 78 | 43. 3 | 29. 1-57. 6 | 13th | 59th | 152d |
| Pilonidal cyst (221)..... | 320 | 18. 9 | 16. 8-21. 0 | 14th | 24th | 36th |
| Ulcer of duodenum (not perforated) (54100)..... | 210 | 26. 2 | 22. 7-29. 7 | 20th | 30th | 55th |
| Infectious hepatitis (092)..... | 160 | 52. 0 | 47. 2-56. 9 | 49th | 68th | 87th |

¹ Data are based on a random 10 percent sample of Air Force military personnel.

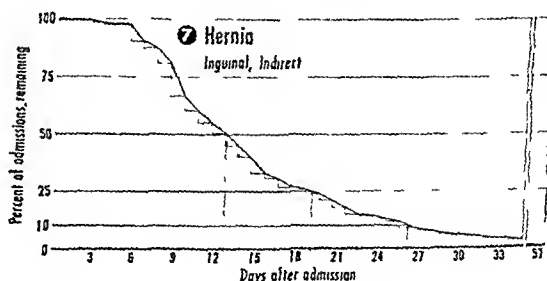
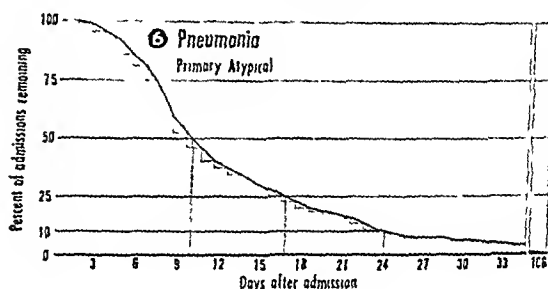
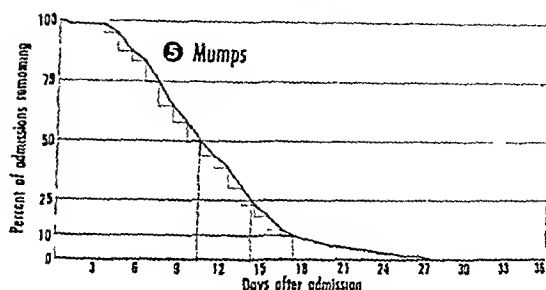
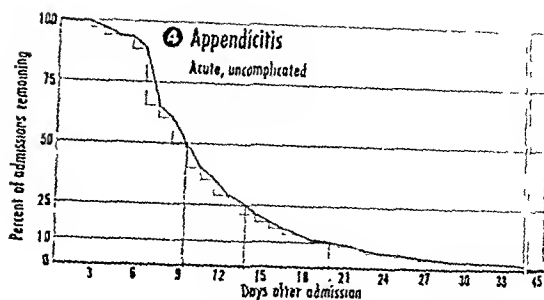
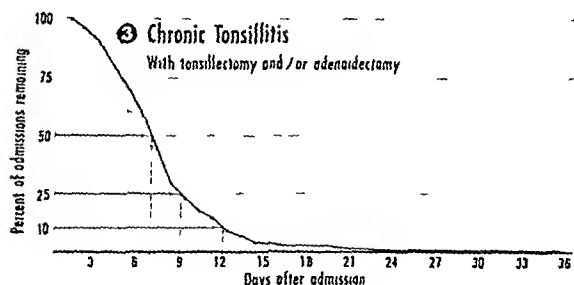
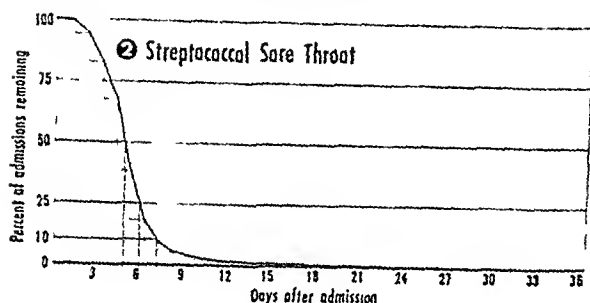
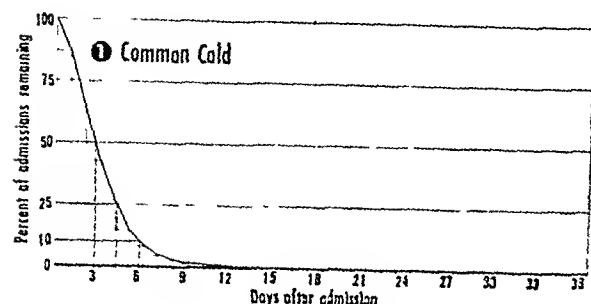
² There is about 1 chance in 20 that the true average lies outside this range (± 2 standard errors).

³ Median day.

Source: DD Form 481; DA Form 8-24; NAVMED-F Card.

Note: Numbers in parentheses after diagnoses are from the International Lists (sixth revision) with U. S. Air Force expansion.

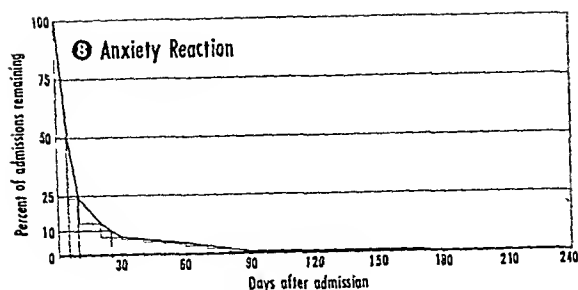
Durations of illness among Air Force personnel in 1954 showing, of those who subsequently returned to duty, the percent of patients remaining on specified day after admission.



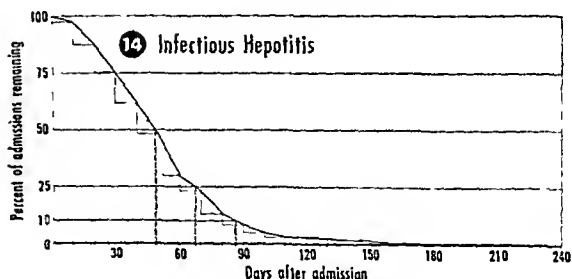
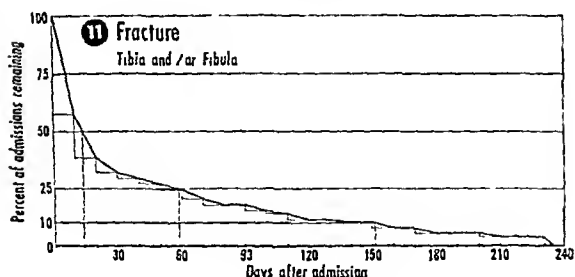
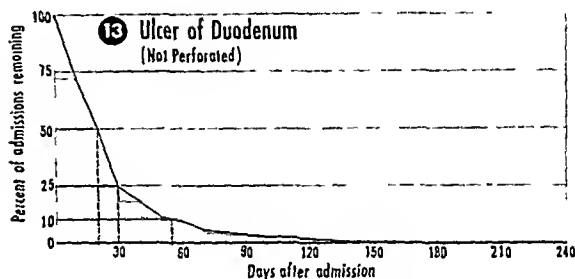
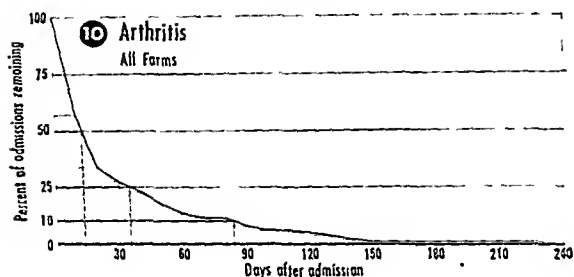
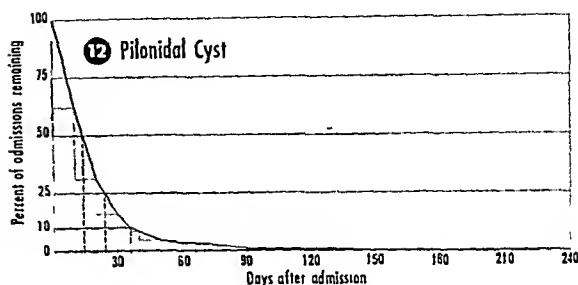
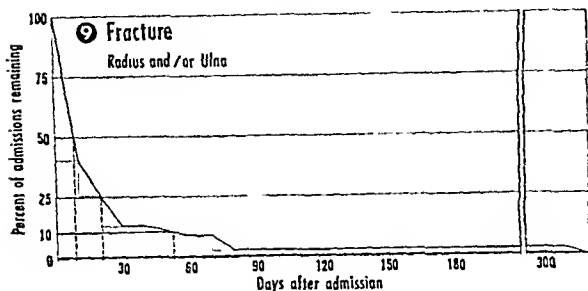
for convenience in presentation. The selected diagnostic conditions have been arrayed in table 2 in order of magnitude of median duration; the graphs, however, have been grouped according to the scale of the abscissa, for easier comparison.

The mean duration, even though influenced by extreme values, has its use as a descriptive parameter. For example, to compute total days lost or accumulated patient loads, for a given diagnosis or for a group of conditions, their mean durations must be known. On the other

hand, percentiles often provide more meaningful measures of a distribution of durations. The most commonly used percentile in vital statistics is the median (50 percent mark). This measure indicates the "middle" duration value. Furthermore, position of this measure in relation to the mean indicates the direction of skewness in an asymmetrical frequency distribution. Frequency distributions according to days lost are not plotted here. The graphs shown are inverse cumulative distributions, thus constituting "cases remaining" curves.



Durations of illness among Air Force personnel in 1954 showing, of those who subsequently returned to duty, the percent of patients remaining on specified day after admission.



Most of the distributions of the illnesses in this study are highly skewed to the right (or even J-shaped). In all instances the mean duration is greater than the median duration. Although any point or points on the percentile scale may be selected for the purpose at hand, the 25 percent and 10 percent marks have been chosen as additional informative measures because of common usage. They represent the number of days of illness elapsed before 75 percent and 90 percent of the cases, respectively, were returned to duty.

Table 2 and the 14 charts show, for each diagnosis, the number of illnesses observed, the mean duration, and the proportion of admissions remaining, by days after admission, with notation of the three percentile points mentioned. Any point on a particular curve indicates the elapsed days of illness (bottom scale) before a given proportion of the cases was returned to duty (complement of the scale at the left). Also, the range of days lost may generally be read directly from the horizontal scale, and, in addition, the modal day of discharge

(the duration most frequently encountered) is at the point showing the steepest drop of the curve.

Noting, for specific illnesses, the difference between the mean and the median gives a measure of the skewness of the distribution. Since skewness is almost invariably to the right, the greatest asymmetry occurs for those illnesses having some unusually prolonged cases. The reason for such skewness is the same as that for a greater range in the distribution, namely that certain diagnostic entities include a large variety of cases with heterogeneous characteristics, as opposed to other diagnoses which include a more homogeneous group of cases. The latter show a smaller range of durations and at the same time greater symmetry in the distribution.

For example, cases of acute uncomplicated appendicitis (fig. 4) of longer than 20 days'

duration were largely accounted for by persons discharged from the hospital who were required to return there at the end of convalescent leave. The type of operation or surgical procedure (not tabulated from these records) in treatment of pilonidal cysts (fig. 12) and duodenal ulcers (fig. 13) has a direct bearing on the duration of illness. The nature of a fracture (figs. 9 and 11) strongly affects the duration; in one case, a compound, comminuted fracture of the radius and ulna with nerve involvement lost 318 days. Other diseases such as the common cold (fig. 1) and streptococcal sore throat (fig. 2), showing a smaller spread of the distribution of durations and concurrent symmetry, suggest a greater homogeneity of characteristics. The means and medians here have approximately the same value.

CDC Laboratory Refresher Training Courses

Refresher training in laboratory methods of diagnoses will be offered at the Communicable Disease Center, Chamblee, Ga., during the period September 1958 through April 1959. Two courses in the following schedule will be presented in two parts, and three will be repeated.

Parasitic diseases:

Part 1. Intestinal parasites. Sept. 15-Oct. 10.

Part 2. Blood parasites. Oct. 13-31.

Rabies. Oct. 6-10; Jan. 12-16.

Viral and rickettsial diseases. Oct. 13-24; Mar. 9-20.

Tuberculosis. Oct. 20-31; Jan. 26-Feb. 6.

Medical mycology: Cutaneous, subcutaneous, and systemic fungi. Jan. 5-30.

Study of pulmonary mycoses. Feb. 9-20.

Veterinary mycology. Mar. 2-6.

Bacterial diseases:

Part 1. General bacteriology. Mar. 2-13.

Part 2. General bacteriology. Mar. 16-27.

Serologic methods in microbiology. Mar. 16-Apr. 3.

Bacterial diseases: Enteric bacteriology. Mar. 30-Apr. 10.

Courses in the following will be offered by special appointment only:

Laboratory methods in the diagnosis of malaria.

Special training in virus techniques.

Typing of *Corynebacterium diphtheriae*.

Special problems in enteric bacteriology.

Phage typing of *Salmonella typhosa*.

Laboratory methods in the diagnosis of leptospirosis.

Serologic differentiation of streptococci.

Bacteriophage typing of staphylococci.

Information and application forms should be requested from the Laboratory Branch, Communicable Disease Center, Public Health Service, P. O. Box 185, Chamblee, Ga.

Commissioned Officer

STUDENT TRAINING AND EXTERN PROGRAM

WILLIAM L. ROSS, M.D.

DURING the 1957 summer months, 120 students from 67 approved professional schools of medicine, dentistry, engineering, and science spent their vacations as Public Health Service Reserve Officers on active duty under the Commissioned Officer Student Training and Extern Program, a career development program known as COSTEP.

COSTEP offers second-year and third-year medical, dental, and engineering students, and science students at the graduate level, on-the-job training in Public Health Service assignments commensurate with their education. These young men and women are thus able to further their professional knowledge and gain experience while earning a salary during breaks in the academic year.

A program must have a purpose, and COSTEP has four:

1. To interest promising students in careers in the Public Health Service.
2. To assist students in furthering their professional knowledge while earning a salary.
3. To give students an opportunity to learn about the functions of governmental health agencies at the National, State, and local levels.
4. To provide the Service with competent personnel during vacation periods.

Last summer's group of 120 students was the largest in the training program's brief history and the first group to participate in the program since it went on a 12-month schedule. The Service has been employing students during the summer months since 1948, when 49 medical students were appointed Reserve Officers in the

Service's Commissioned Corps and called to active duty during school vacations. The commissions were terminated, however, when the students returned to school in the fall. This procedure was repeated in 1949 and 1950.

During the 1951-54 period, dental, engineering, and graduate science students, in addition to medical students, were employed during the summer months under the civil service system. In 1955, students accepted for the Summer Student Program—as it was then known—were appointed to the Commissioned Reserve (the inactive duty reserve component of the Commissioned Corps) and called to active duty when the spring semester ended.

Last year, the program was officially designated as COSTEP, and on July 1, 1957, went on a 12-month basis. This permits students attending schools on the quarter system, with vacations at times other than the summer months, to receive Service assignments during their free periods. As an added inducement, students still in school who have satisfactorily completed a COSTEP assignment are eligible to apply for reassignment the following year.

Assignments

Research assignments under COSTEP are available at the National Institutes of Health in Bethesda, Md., the Communicable Disease Center in Atlanta, Ga., the Sanitary Engineering Center in Cincinnati, Ohio, or in Public Health

Dr. Ross is chief, Recruitment Branch, Division of Personnel, Public Health Service.

Service field activities elsewhere in the country.

Clinical assignments are available in several of the Service's 16 general and specialty hospitals and many of its 55 hospitals maintained for American Indians and Alaska natives.

Students interested in preventive medicine may be assigned to a wide variety of public health programs in many parts of the country. They participate in communicable disease control, sanitary engineering activities, general epidemiology, accident prevention, air pollution control, chronic disease control, occupational health programs, tuberculosis control, venereal disease control, and other related activities.

Second-year students, as a rule, are assigned to research activities. Third-year medical and dental students are usually given preference for clinical clerkships or preventive medicine assignments, but are not excluded from research work. Assignments to clinical clerkships in Alaska are given only to students who are able to serve at least 90 days on active duty.

By category, assignments are generally as follows:

Medical students are assigned to the Service's general and specialty hospitals (up to 1,250-bed capacity) and to its Indian hospitals in the United States and Alaska. They may engage in employee health programs or become research assistants in preventive medicine activities. Some are assigned to mental health studies, and others become research assistants in pharmacology, biochemistry, psychology, metabolic studies, neuropsychology, neurochemistry, and related fields of medical-biological research.

Dental students perform essential duties as research assistants in genetics, biochemistry, and bacteriology. They serve in the dental clinics of the Service's general and specialty hospitals and Indian hospitals. They assist regional dental consultants, work on fluoride analysis, and do field X-ray work.

Engineering students are employed in water pollution control programs, radiological health research, and field engineering for water and sewerage facilities on Indian reservations. Engineering students also work on field survey teams and assist in planning and engineering construction, and in air-conditioning design, construction, and maintenance. Assignments

are also made in insectborne and rodentborne disease control activities.

Science students are offered a variety of assignments. These include cell production and tissue culture, chemistry laboratory work, medical entomology, rabies or psittacosis studies, biological control of mosquitoes, animal psychology, sociology and anthropology, psychiatric aide assistants, social psychology aides, and mental health surveys.

Last summer, one medical student served as assistant to the anesthesiologists in the Clinical Center, National Institutes of Health. Five medical and four dental students took medical histories, performed physical examinations, and conducted hematological studies among 5,000 inhabitants of an in-married population group in an intensive genetic field study of the prevalence of hereditary disease. A science student interested in immunology received instruction in the testing of diagnostic reagents and blood-banking procedures. A psychology student participated in studies of the treatment of children with primary behavioral disturbances.

One of the engineering students reviewed construction plans of oceangoing vessels to determine if they conformed to Public Health Service sanitation standards for water supply and distribution, food preparation, storage, and serving areas, and ratproofing. Other engineering students assisted Service engineers in survey work for water and sewerage improvements on an Indian reservation in the southwest.

Requirements and Remuneration

To be eligible for the Commissioned Officer Student Training and Extern Program, a student must:

1. Be a United States citizen.
2. Be physically qualified for appointment as a Public Health Service Reserve Officer.
3. Have completed at least 2 years of approved professional schooling by the end of the current academic year or, in the case of science students, be at the graduate school level.
4. Submit official transcripts covering undergraduate study.
5. Be recommended by a dean or department head.



Dental student (left) watches trial of a new drill on a hamster at the National Institute of Dental Research.

Students who are commissioned in the Public Health Service and called to active duty under COSTEP receive the pay and allowances of a junior assistant sanitarian, the Service officer grade equivalent to Army 2d lieutenant and Navy ensign. In addition, they are reimbursed for travel from the points at which they receive their calls to active duty to their assignments, and back to the points of origin. The monthly pay and allowances for a junior assistant sanitarian with less than 2 years cumulative service are:

| | With depend- ents | Without depend- ents |
|------------------|-------------------------|----------------------------|
| Base pay..... | \$222 30 | \$222. 30 |
| Quarters..... | 85 50 | 68 40 |
| Subsistence..... | 47 88 | 17. 88 |
| Total..... | \$355 68 | \$338 58 |

The Federal income tax, computed on base pay only, is withheld from each month's pay. Previous active and inactive duty with the Armed Forces, the Public Health Service, or the Coast Guard is counted toward longevity for pay purposes.

Students selected for COSTEP are appointed to the Commissioned Reserve and called to active duty for 60 to 90 days. Although leave is accumulated during the tour of duty, COSTEP students are not granted leave except for emergencies. At the end of the duty period, however, they are paid a lump sum for all accumulated leave.

After COSTEP

Students who perform satisfactorily may remain in the Commissioned Reserve pending

completion of professional education. Medical students retain their inactive duty status until they either apply for and are selected for Public Health Service internships or until they complete their intern training outside the Service. Those interning outside the Service, who have military obligations, are called to active duty at the completion of their internships or their commissions are terminated.

Dental students, at the completion of their professional education, may apply for either a Service dental internship or active duty as a staff dental officer.

Draft-eligible students who have satisfactorily completed COSTEP assignments may retain their reserve commissions until they receive their appropriate medical, dental, engineering, or science degrees. Once the degree is earned, the student's commission is terminated unless he applies for and receives an active duty assignment in the Public Health Service in order to fulfill Selective Service obligations. Engineer and science students who have satisfactorily completed a COSTEP assignment, and are still in school, are eligible to apply again for employment under the program.

Because the Commissioned Corps is one of the uniformed services of our country, the serving of specified amounts of time (up to 3 years) in the Corps satisfies military obligations under the Universal Military Training and Service Act. Service under COSTEP or as a Public Health Service intern, however, is not counted toward the satisfaction of military obligations.

Applications and Reserve Commissions

Students interested in COSTEP assignments during the summer months must submit their applications each year before February 1 to the Surgeon General, U. S. Public Health Service (P), Washington 25, D. C. Applications for assignment at other times of the year must be submitted at least 120 days beforehand.

It is not necessary for medical students to apply for COSTEP assignments in order to receive appointment to the Commissioned Reserve. Medical students interested in intern-

ships, active duty to fulfill Selective Service obligations, or careers in the Public Health Service may apply for appointment to the Commissioned Reserve any time after completing their first year of medical school. Dental, engineering, and science students, however, can receive reserve appointments only through COSTEP. Medical or dental students who have satisfactorily completed a Public Health Service internship are continued on active duty unless they request termination of their commissions. The Service imposes no mandatory period of duty upon its Commissioned Reserve officers.

COSTEP Survey

A survey of students who were employed under COSTEP during the summer months of 1957 disclosed that they found their assignments interesting and professionally valuable. Eighty-six percent indicated that they planned to apply for active duty in the Commissioned Corps after graduation. More than half of the group of 120—nearly all of whom are eligible for participation in 1958—are planning to apply again for COSTEP assignments. Most of the group felt that their assignments provided professional experience that would be helpful in school. Fifty-nine percent reported that they found their work "very interesting" and 71 percent found their professional education useful in their COSTEP assignments.

Features that many students named as advantages of the program were professional experience; working with congenial people; opportunity to learn new developments and exercise initiative; the ability, helpfulness, and interest of supervisors; and the opportunity to work with patients.

When asked what special efforts were made to aid in their professional development, the students mentioned the opportunity to attend hospital rounds outside their departments, outside reading and reporting to a group, attending clinical and pathology conferences, seminars, time for literature research, and the availability of experienced professional personnel to answer questions and discuss work.

Coxsackie virus group B, type 5, widely distributed in the midwest during the summer of 1956, was highly prevalent in Iowa, with lower frequencies observed in Kansas, Missouri, and Nebraska. Concurrently in Iowa, the incidence of poliovirus infection was found to be extremely low.

Infections With Coxsackie Virus B5 in Six Midwestern States

TOM D. Y. CHIN, M.D., JOHN C. GREENE, D.M.D., and HERBERT A. WENNER, M.D.

THE RECOGNIZED viral agents responsible for the syndrome defined as benign aseptic meningitis include mumps, ECHO (enteric cytopathogenic human orphan), Coxsackie, poliomyelitis, and the arthropod-borne encephalitis viruses. Observations made during the summer and autumn months of 1956 indicated an unusually high incidence of cases of aseptic meningitis in certain midwestern communities. Fecal specimens submitted for poliomyelitis surveillance studies yielded a large number of isolates identified as Coxsackie virus, type B5.

The evidence that the B5 virus was etiologically related to many of the cases observed was reinforced by a singular study of a localized outbreak of aseptic meningitis caused by Coxsackie B5 virus in Cerro Gordo County, Iowa, during the same summer (1). The present report summarizes our experiences encountered with this virus with particular reference to differences in the distribution in the six midwestern States.

Materials and Methods

During the summer and autumn months of 1956, fecal specimens obtained from 694 individuals were studied in connection with the poliomyelitis surveillance program. Of this

number, 365 were obtained from patients believed to have poliomyelitis; the remaining 329 specimens were collected from patients and family contacts during an investigation of an outbreak of aseptic meningitis. These specimens were from residents in the midwestern States of Arkansas, Iowa, Kansas, Missouri, Nebraska, and Oklahoma. In addition to the 694 fecal samples studied in the virus laboratory at the University of Kansas, the distribution study included 664 individual specimens also obtained from poliomyelitis patients, bringing the total of fecal samples to 1,358. The 664 specimens were studied in the State health department laboratories in Kansas and Missouri and in the virus laboratory of the University of Nebraska College of Medicine, results of isolations in these laboratories having been supplied by Dr. Charles A. Hunter, Irma C. Adams, and Helen W. Reihart.

Dr. Chin is assistant chief of the Kansas City Field Station, Communicable Disease Center, Public Health Service, where Dr. Greene serves as dental surgeon on temporary duty. Dr. Wenner is research professor of pediatrics at the University of Kansas Medical Center, Kansas City, Kans. Assisting in the study were Clifton R. Gravelle of the Kansas City Field Station and Vernon E. Scholes of the University of Kansas Medical Center.

completion of professional education. Medical students retain their inactive duty status until they either apply for and are selected for Public Health Service internships or until they complete their intern training outside the Service. Those interning outside the Service, who have military obligations, are called to active duty at the completion of their internships or their commissions are terminated.

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When asked what special efforts were made to aid in their professional development, the students mentioned the opportunity to attend hospital rounds outside their departments, outside reading and reporting to a group, attending clinical and pathology conferences, seminars, time for literature research, and the availability of experienced professional personnel to answer questions and discuss work.

Table 2. Cocksackie virus B5 isolations from fecal specimens, by county, Iowa, 1956

| County | Number of persons | Number positive | Percent positive |
|------------------|-------------------|-----------------|------------------|
| Cerro Gordo----- | 135 | 82 | 60.7 |
| Black Hawk----- | 42 | 29 | 69.0 |
| Dubuque----- | 39 | 21 | 53.8 |
| Polk----- | 24 | 13 | 54.2 |
| Webster----- | 13 | 5 | 38.5 |
| Calhoun----- | 19 | 5 | 26.3 |
| Others----- | 57 | 18 | 31.6 |
| Total----- | ¹ 329 | 173 | 52.6 |

¹ Comprising 249 patients and 80 well persons.

gitis appeared in epidemic proportions in several localities in Iowa. The occurrence of this illness was first noted in Polk County during early July. In the middle of July similar illnesses were observed in Mason City, the county seat of Cerro Gordo County. Because the clinical features suggested that these illnesses were not caused by polioviruses, a detailed study was made in Cerro Gordo County in order to define the etiology and the clinical and epidemiological characteristics. Etiological studies indicated that these illnesses were caused primarily by Cocksackie virus, type B5.

The frequency with which Cocksackie B5 virus was encountered in different localities in Iowa appears in table 2. In Cerro Gordo County the virus was recovered from 82 of the 135 individuals examined. Of the 82 Cocksackie B5 strains recovered, 61 were isolated from 83 individuals with illness, while 21 were recovered from 52 well individuals, the majority being household contacts. A high frequency of virus recovery was obtained in the counties of Black Hawk, Polk, and Dubuque, whereas lower frequencies were observed in Webster and Calhoun Counties. Although extensive epidemiological investigation was conducted only in Cerro Gordo County, these data seem to indicate that a similar type of illness was also occurring in epidemic proportions in Black Hawk, Polk, and Dubuque counties.

The distribution of Cocksackie B5 viruses isolated from 144 Iowa patients by week of onset of illness appears in figure 2. The major number of isolations were made from patients who

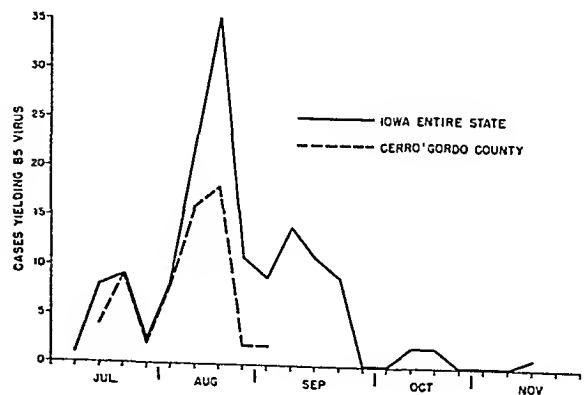
were ill during the months of August and September with the highest frequency occurring during the middle of August. A similar distribution was obtained for patients in Cerro Gordo County alone. In the State as a whole the seasonal distribution of Cocksackie B5 virus corresponded to that observed for poliomyelitis.

The distribution of Cocksackie virus B5 isolated from stool specimens of 329 Iowa residents analyzed according to age and health status is shown in table 3. Approximately 58 percent of the individuals who had an illness manifested as either aseptic meningitis or minor illness yielded the B5 virus, while about 36 percent of those with a history of no illness excreted B5 virus. In both ill and well groups the frequency of excretion was higher among those under 20 years than in those over 20 years of age.

Discussion

The first Cocksackie viruses were recovered by Dalldorf and Sickles in 1947 (5). During the past 10 years these viruses, now constituting a family of 24 members, have been encountered with an increasing frequency in association with a variety of illnesses. As a result of recent wide application of tissue culture techniques, Cocksackie viruses of types A9, B1, B2, B3, and B4 have been commonly recovered from patients with aseptic meningitis, pleurodynia, and myalgia, and occasionally

Figure 2. Cocksackie virus B5 isolations from feces of patients, by week of onset, 1956.



Stool specimens were collected by practicing physicians or by the staff members in local hospitals. Usually single specimens were obtained. Fecal specimens were collected from household contacts only in connection with special investigation of localized outbreaks. The specimens were mailed unfrozen to the laboratory, where they were stored at -20°C . and held at this temperature until used.

The methods used for preparation of stools and for virus isolation and identification were those described by Wenner and Miller (2). Roller tube cultures of trypsin-dispersed monkey kidney cells prepared according to the methods described by Youngner (3) were routinely employed. Each specimen was tested in three culture tubes, using 0.1 ml. of stool extract per tube. The cultures were maintained for a 7-day period. Fluids of those cultures showing cytopathic changes were harvested for identification, using initially type-specific hyperimmune poliomyelitis antisera (4). When the harvested fluid was not neutralized by each of the typing serums or by a combination of the serums, further identification was carried out with Cocksackie antisera types 99, B1, B2, B3, B4, and B5, and with 14 types of ECHO antisera. Neutralization was considered to have occurred if the culture tubes containing the virus-serum mixtures showed no cytopathic changes while cytolysis was present in the virus control tubes, and if this effect persisted for at least 2 additional days.

Virus Distribution in the Six States

Data on the frequency with which polioviruses and Cocksackie viruses were encountered in the specimens from 1,358 individuals submitted for study are summarized in table 1. The geographic distribution of individuals providing Cocksackie B5 viruses appears in figure 1.

The B5 virus was recovered from the stools of 270 individuals, and polioviruses, predominantly type 1, were recovered from the stools of 275. A stool from one individual yielded both poliovirus and Cocksackie B5 virus. Patients from Iowa provided a larger number of B5 viruses than those from the other five States studied. The recovery rates among 329 fecal

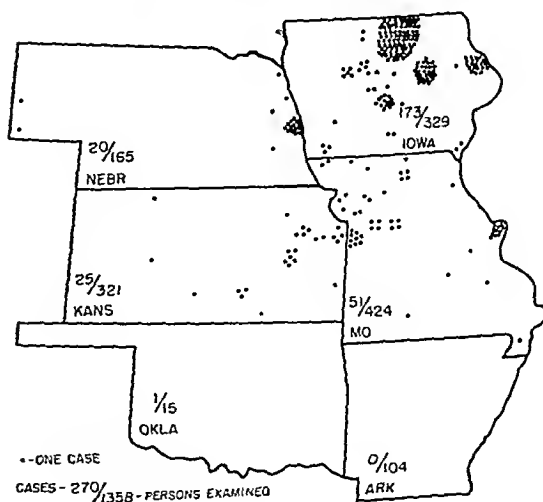
Table 1. Cocksackie virus B5 and poliovirus isolations from fecal specimens, by State, 1956

| State | Number of persons | Cocksackie virus B5 | | Polioviruses | |
|---------------|-------------------|---------------------|---------|--------------|---------|
| | | Number | Percent | Number | Percent |
| Arkansas..... | 104 | 0 | 0.0 | 37 | 35.6 |
| Iowa..... | 329 | 173 | 52.6 | 8 | 2.4 |
| Kansas..... | 321 | 25 | 7.8 | 56 | 17.4 |
| Missouri..... | 424 | 51 | 12.0 | 141 | 33.2 |
| Nebraska..... | 165 | 20 | 12.1 | 29 | 17.6 |
| Oklahoma..... | 15 | 1 | 6.7 | 4 | 26.7 |
| Total..... | 1,358 | 270 | 19.9 | 275 | 20.2 |

samples from Iowa were about 53 percent for Cocksackie virus and 2.4 percent for polioviruses. In Kansas, Missouri, and Nebraska, the recovery rate for Cocksackie virus was approximately 11 percent and for polioviruses approximately 25 percent. In contrast with the experience in Iowa, Cocksackie B5 virus was not detected in fecal specimens from 104 individuals in Arkansas, although polioviruses were recovered from approximately one-third. The number of specimens originating in Oklahoma was too small for reliable comparison; nevertheless, one strain of Cocksackie B5 virus was recovered in the 15 fecal samples examined.

During the summer of 1956 aseptic menin-

Figure 1. Distribution of Cocksackie virus B5 in six midwestern States, 1956.



the introduction and continued use of the Salk vaccine.

As for age distribution of those infected with the B5 virus, rates of infection were approximately the same for persons under 20 years of age in both ill and well categories. These rates were significantly higher than those of the older group. This difference in age-specific incidence indicates that the older population was more resistant to Cocksackie B5 virus infection, possibly because of infection some years ago with an agent similar or antigenically related to Cocksackie virus B5. The uniform infection rates among persons in younger age groups further suggest that Cocksackie virus B5 probably had not been active in Iowa during recent years.

Summary

During the summer of 1956 Cocksackie virus was found widely distributed in several mid-western States. Infections due to this virus appeared in epidemic proportions in several localities in Iowa; about 53 percent of the stools examined yielded Cocksackie virus B5, while about 2 percent contained polioviruses. The frequency of isolating the B5 virus in Kansas, Missouri, and Nebraska ranged from 8 to 12 percent. In Arkansas, none of 104 individuals examined yielded Cocksackie viruses, while 36 percent had polioviruses. One strain of Cocksackie virus B5 was isolated from 15 individuals examined in Oklahoma.

Studies in Iowa also showed that the seasonal incidence of Cocksackie B5 infection was similar to that of poliomyelitis. The frequency of detecting this virus was higher among persons under 20 years than in those over 20 years of age.

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Correction

In Home Safety Activities, *Public Health Reports*, May 1958, page 455, change "National Health Council" to "National Safety Council."

Table 3. Cocksackie virus B5 isolations from feces by age group and health status, Iowa, 1956

| Age group (years) | Ill | | | Not ill ¹ | | |
|-------------------|-------------------|-----------------|------------------|----------------------|-----------------|------------------|
| | Number of persons | Number positive | Percent positive | Number of persons | Number positive | Percent positive |
| 0-4..... | 51 | 35 | 68.6 | 9 | 6 | 66.7 |
| 5-9..... | 68 | 40 | 58.8 | 15 | 6 | 40.0 |
| 10-14..... | 42 | 27 | 64.3 | 8 | 5 | 62.5 |
| 15-19..... | 17 | 10 | 58.8 | 3 | 2 | 66.7 |
| 20 and over..... | 71 | 32 | 45.1 | 45 | 10 | 22.2 |
| Total..... | 249 | 144 | 57.8 | 80 | 29 | 36.2 |

¹ Comprising mostly household contacts.

from those with myocarditis. Until the summer of 1956, the type B5 Cocksackie virus, which was first isolated by Steigman in 1952 (6), had been found only occasionally. The data reported here and those recently reported by Syverton and associates (7) represent the first recognition of a widespread occurrence of this virus in association with human illness.

The variation in the geographic distribution of this virus in the six midwestern States is worthy of comment. Obviously, this virus appeared in epidemic proportions in Iowa. Of the 329 Iowans studied, about 53 percent yielded the B5 virus, while only about 2 percent yielded polioviruses. In contrast, none of the stools from 104 patients in Arkansas yielded Cocksackie viruses, while 36 percent were shown to contain polioviruses. In Kansas and Missouri, polioviruses were more commonly encountered than the B5 virus, while both viruses appeared in about equal frequency in Nebraska. The number of specimens obtained from Oklahoma was too small for reliable comparison.

Suggested as a factor producing variations in geographic distribution of Cocksackie B5 virus is the apparent incompatibility of Cocksackie B and poliovirus infections. In the laboratory Cocksackie B infections appear to exert an interfering effect on poliovirus infections in mice (8, 9) as well as in tissue cultures (10). Field observations also suggest that such interference may occur in man, and the evidence in favor of this hypothesis has recently been reviewed by Dalldorf (11). A high incidence of Cocksackie B infection is usually accompanied by a low incidence of polio-

myelitis, and furthermore, when Cocksackie B and poliovirus infections occur simultaneously in the same area, the peak incidence of Cocksackie infection usually precedes that of poliovirus infection by 1 or 2 months (12).

Besides the possibility that it represents the effect of interference, the high incidence of Cocksackie B5 virus infection associated with a low incidence of poliovirus infection can also be explained by certain ecologic and immunological factors. They might be the impact of past infections, resistance acquired through vaccinations, balance of immune and susceptible persons, and the introduction of a new virus into a population. The observations made in Mason City (1) as well as those reported here for other parts of Iowa indicate that the residents of that State were highly susceptible to Cocksackie B5 virus infection. Hence, introduction of this virus into the State, under favorable conditions, would result in an epidemic. On the other hand, the population of Iowa was relatively resistant to poliomyelitis as a result of past infections, and their immune status had been reinforced by the recent use of the Salk vaccine.

A review of the Iowa data for the past 3 years shows that when the Salk vaccine was first introduced in 1954 there were 1,445 reported cases of poliomyelitis, 525 (36.3 percent) of which were paralytic. In 1955, the number dropped to 556, with 114, or 20.5 percent, paralytic. During the following year there were 580 cases, but only about 8 percent were paralytic. This decline in incidence and in the ratio of paralytic cases coincides with

the introduction and continued use of the Salk vaccine.

As for age distribution of those infected with the B5 virus, rates of infection were approximately the same for persons under 20 years of age in both ill and well categories. These rates were significantly higher than those of the older group. This difference in age-specific incidence indicates that the older population was more resistant to Coxsackie B5 virus infection, possibly because of infection some years ago with an agent similar or antigenically related to Coxsackie virus B5. The uniform infection rates among persons in younger age groups further suggest that Coxsackie virus B5 probably had not been active in Iowa during recent years.

Summary

During the summer of 1956 Coxsackie virus was found widely distributed in several mid-western States. Infections due to this virus appeared in epidemic proportions in several localities in Iowa; about 53 percent of the stools examined yielded Coxsackie virus B5, while about 2 percent contained polioviruses. The frequency of isolating the B5 virus in Kansas, Missouri, and Nebraska ranged from 8 to 12 percent. In Arkansas, none of 104 individuals examined yielded Coxsackie viruses, while 36 percent had polioviruses. One strain of Coxsackie virus B5 was isolated from 15 individuals examined in Oklahoma.

Studies in Iowa also showed that the seasonal incidence of Coxsackie B5 infection was similar to that of poliomyelitis. The frequency of detecting this virus was higher among persons under 20 years than in those over 20 years of age.

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Correction

In Home Safety Activities, *Public Health Reports*, May 1958, page 455, change "National Health Council" to "National Safety Council."

A Manual on Recordkeeping and Statistical Reporting for Mental Health Clinics

*PHS Publication No. 539. 1957.
72 pages; illustrated. 45 cents.*

Methods and record forms evolved by clinics, States, and the National Institute of Mental Health, Public Health Service, for routine recording, collection, and compilation of selected items of information about patients and the services they receive in outpatient psychiatric clinics are presented in this manual.

The procedures are designed to provide the minimum of essential data included in the Annual Statistical Report of Outpatient Psychiatric Clinics, which is the report used in a national reporting program developed by the National Institute of Mental Health. The suggested procedures also take into account some variation in need by clinics and States for data beyond those collected nationally as well as differences in availability of clerical and statistical personnel and equipment.

Evaluation of Obstetric and Related Data Recorded on Vital Records and Hospital Records: District of Columbia, 1952

Vital Statistics—Special Reports. Selected Studies. Vol. 45, No. 13. Nov. 20, 1957. By Ella Oppenheimer, Samuel Schwartz, Alexander L. Russell, Matthew Tayback, and Eleanor P. Hunt. Pages 359-416; tables. 40 cents.

This study concerns the collection, development, and use of medical information reported on birth certificates. A sample group of 1,000

births in the District of Columbia's major hospitals is used to evaluate the accuracy and completeness of reporting such items as birth weight, period of gestation, conditions of pregnancy and labor, and method of delivery. The medical information on the birth certificates is compared with matched hospital record data. The method and the findings are given in detail.

A second phase of the study demonstrates the use of medical information from birth and stillbirth certificates and hospital records in showing significant relationships between obstetric factors and the outcome of pregnancy.

The report concludes with a summary of actions taken in the District of Columbia to develop and improve medical information derived from birth certificates.

Health Statistics From the U. S. National Health Survey

Preliminary report on volume of physician visits, United States, July-September 1957

*PHS Publication No. 584-B1. 1958.
25 pages; tables. 25 cents.*

Preliminary report on volume of dental care, United States, July-September 1957

*PHS Publication No. 584-B2. 1958.
22 pages; tables. 25 cents.*

First and second of a new series (Series B), these reports present data from household interviews conducted by the U. S. Bureau of the Census for the Public Health Service. The first report estimates the number of physician visits per person, by age, sex, and rural-urban residence. It gives the distribution by type of service and by place of visit (home, physician's office, hos-

pital clinic, or other) and shows the time interval since the last physician visit.

The second report estimates the volume of dental visits classified according to sex, age, urban-rural residence, and type of service (fillings, extractions, cleaning teeth, examination, denture work, straightening, gum treatment, and other). It also shows distribution of the population according to interval since last dental visit, by age, sex, and urban-rural residence.

Notes on methods and definitions of terms are given in the appendixes in each publication.

An Outline of Venereal Disease Management

PHS Publication No. 573. Revised 1957. 14 pages. 15 cents.

Information on diagnosis and management of venereal diseases is brought up to date in this revised booklet. Suggested epidemiological techniques and followup procedures are included, as well as detailed schedules of treatment for syphilis, gonorrhea, nonspecific urethritis, saprophytic spirochetal balanitis, chancroid, granuloma inguinale, and lymphogranuloma venereum.

The schedules are based on experiences of a large number of clinics and clinicians, as assembled by the Venereal Disease Branch, Communicable Disease Center, Public Health Service.

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared by other Federal agencies.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications other than its own.

More people are attaining advanced age. Will social science help them to enjoy it? What roles are the aged to perform for their satisfaction? And how are cultural values to be adjusted to provide proper appreciation for such roles?

Sociological Aspects of Aging

HOWARD E. JENSEN, Ph.D.

THE biological and sociological problems of aging, although complementary, are quite disparate. Biological research on the progressive changes taking place in the aging organism deals with objective anatomical and physiological phenomena directly measurable by physically standardized instruments. Sociological investigation of the interrelationships of the aging organism and the sociocultural environment, on the other hand, is concerned with covert or subjective attitudes and values that are only indirectly measurable by instruments. These, in turn, involve various culturally conditioned judgments in their construction, and require constant revision and restandardization with advances in theory and changes in cultural value systems, if they are commensurable at all.

Furthermore, as we pass from the biological to the sociological investigation of aging, the locus of research shifts from the more static conditions of the laboratory and clinic to the more dynamic settings of fieldwork where scientific controls are at best crude, and often

impossible. In no field is it more difficult to transmute the particularities of individual case study into the generalities of statistical analysis.

Again, unlike biological systems, human social systems are structured not by the genetically determined reaction patterns of the biological units that compose them, but by behavior patterns invented and acquired in social interaction. These socially derived patterns constitute the systems of cultural values which determine the social structure of human groups. Such structures do not age and die. They either commit suicide by man's inability to devise new patterns capable of dealing with the problems generated from within, or they are murdered by his inability to repel conquest from without. A social system is simply the blueprint according to which interpersonal and social functions have occurred in the past, are occurring in the present, and may be predicted to recur in the future.

Therefore, the aging of an individual, as a sociocultural phenomenon, is defined not by physical deterioration or by time but by the value system of his society. A person is sociologically old when he is so regarded and treated by his socii. The problems of personal and social adjustment confronting the aged are the resultants of the role and status accorded them by the group, the social provisions for their continuing prestige and security, and the opportunities afforded them to achieve these ends by their own initiative.

*Dr. Jensen was chairman of the department of sociology and anthropology, Duke University, Durham, N. C., when his paper, on which this one is based, was delivered before the Duke University Council on Gerontology at a seminar on April 2, 1957. He is now professor emeritus of sociology. The full paper was published in *Proceedings of Seminars, 1956-57*, edited by F. C. Jeffers, A. H. Edens, and E. W. Busse, November 1957.*

There is neither time nor need to survey the widely divergent perspective of aging in various social milieus. Those interested in pursuing this subject further may well begin with Simmons (1) and Eisenstadt (2). Suffice it to say that universally these varying perspectives are the result of the interplay of automatic and impersonal physical, biological, and social forces on the one hand and conscious and purposive personal and social efforts on the other. Sociological interest focuses upon this interplay in all cultures.

The aging populations of all cultures experience similar physiological changes that manifest themselves overtly in deterioration of physical and ultimately of mental capacities. Universal, too, are the probabilities of bereavement by the death of one's mate, especially for women. For the greater longevity of women, insofar as comparative data are available, seems to be a phenomenon common to all cultures.

Changes in physical activities are everywhere precipitated by these overt manifestations. But sociological interest in the problem of aging does not focus, as does the biological interest, upon the objective measurement of these changes. Instead, it focuses upon the investigation of the cultural value systems that define these changes in role and status, and upon the meaning of these changes to the aging persons themselves and to their contemporaries.

Problems of Aging

Sociologically considered, the problem of aging in contemporary western culture is a new phenomenon in human history in at least four ways. Two of these, the increasing number of the aged and the extension of the time during which they enjoy (or suffer) that status, are too well known to require more than passing mention.

Two other circumstances have so completely changed the sociological character of the problem that it is hardly an exaggeration to say that prior to their emergence the problem did not exist. These are the abruptness of the social transition from productivity to retirement and the loss of role and status that accompanies it.

In the simpler cultures, as well as in our own until the last 2 or 3 generations, the gradualness of the physiological changes was paralleled by

a corresponding gradualness in the change of social functions, which permitted a smooth transition and a gradual adjustment to the new functions by both the aged and their younger contemporaries.

Again, in the simpler societies and in traditionally oriented cultures like our own until recently, the aged, as a general rule, usually suffered no such loss of role and depreciation of status as is the fate of the majority in our highly developed technological civilization.

In every society, aging is accompanied by changes in the active roles played by the aged and in the functional categories to which they belong. In the simpler societies and in cultures oriented to tradition, role and status are usually ascribed rather than achieved. That is, the functions to be performed by the person are determined by characteristics over which he has no control, among the more important of which are family lineage, sex, and age. When roles are age-graded the person acquires the status assigned to his role. One knows precisely what changes of role will be expected of him and what rank will be accorded him as he passes from one age grade to another. This transition is so gradual, and the social conditions under which it takes place so stable, as to permit the value systems of the culture to be effectively internalized in the character of the person. Thus, a fair degree of harmony between the expectations of the person and the requirements of the group is maintained.

But in a society based on applied science and technology, both role and status are achieved rather than ascribed. The role is determined by the individual's capacity to perform the functions required, and status by the evaluation placed by the group upon the role performed. In such a society role and status are conjoined. Status is thus linked with the role rather than with the person performing it, so that when the role is no longer performed, the status tends to deteriorate.

Tradition and Status

In societies with ascribed status there are at least six distinct roles ascribed to the aged that give them a recognized and assured social position:

First, the aged are the preservers and disseminators of the knowledge of the group. They are its library as well as its teachers, for the sacred lore is stored only in their memories. As a Yoruba proverb states it, "A man may be born to fortune, but wisdom comes only with length of days."

Second, by virtue of this monopoly the aged hold a strategic position in deciding the policies of the group. The maxim, "Old men for council, young men for war," is practically universal in traditionally oriented societies.

Third, and closely associated with the foregoing, are the rights and privileges associated with parental authority and the ownership and management of family property. These prerogatives may persist long after death through the sacred and binding character often accorded by the culture to the dying wishes of family heads with regard to property and other matters within their jurisdiction.

Fourth, the aged are often the magicians, witch doctors, priests, and seers as well as the sages of the group. This role also frequently survives death through the prevalence of ancestor worship and fear of ghosts.

Fifth, they possess the experience and skill required to supervise the industrial and decorative arts.

All these are roles that require little physical strength or stamina. They can be performed as long as accurate memory, sound judgment, and social skill in managing interpersonal relationships continue. They are also highly honorific roles whose prestige usually outlives the person's capacity to perform them and gives to age as such a respect and dignity that redounds to the benefit of less competent contemporaries.

For the latter there remains a sixth role. The lighter auxiliary tasks of field and herd, of hearth and household fall to their hands. By these activities they release mature adults of both sexes for more strenuous work and so maintain their status as participants in the common life.

Technology and Status

All of these roles have played a significant part in the history of our own culture. Some

of them have been abolished by the processes of social change, and those that survive have been greatly reduced in significance. The monopoly of wisdom and knowledge began to weaken with the invention of writing, and has finally been wiped out by universal mass education. The ceremonial role ceased with the passing of magic and the rise of professionally trained religious leaders. The policy-forming role survives only for the higher professional, administrative, and bureaucratic classes, most notably in politics. Finally, the rise of technology has greatly reduced the role of the hand-craftsman and the need for auxiliary services.

Prescribed roles have dwindled as technology has advanced and such functions as remain to the aged are no longer the prerogative of age. In a technological civilization, roles are won in strenuous competition requiring youth and stamina. Status is achieved chiefly through the performance of role, and, for the majority of the aged, status does not long survive its passing.

Older persons of the upper classes of business and professional people who have been successful may continue to be in active demand on a part-time basis or as consultants, and to enjoy an ascribed status after they have relinquished the roles through which status was achieved. But for those of the lower classes, especially the unskilled workers, the loss of their economically productive roles is usually less gradual, less voluntary and reversible, and they enjoy no such halo effects of past achievement. They are suddenly precipitated into a situation where they lose their financial independence, their capacity to make their own decisions, and, what is worse, the esteem of their fellows and their own self-respect.

But new technological changes now in process may have some effect in reversing this trend, as an increasing percentage of the gainfully employed is now being absorbed into professional, technical, clerical, and other more honorific pursuits and a decreasing percentage into the more arduous and unskilled occupations.

For humanistically inclined researchers, the biological objective of gerontology is to make old age attainable; the sociological objective is to make it satisfying. Medical progress has increased the proportion of the aged; technological progress has reduced the proportion of

meaningful roles available to them, and the cultural lag in the social sciences leaves us as yet inadequately equipped to deal with the resultant problems of personal and social adjustment.

For social research, the fundamental problem is to discover and investigate the social—not the physical—barriers that limit the aged in the pursuit of satisfying goals. For applied sociology, the problem is to devise techniques to remove or reduce these barriers, or, at least, to compensate for them. Techniques must also be developed to help aging people to gain insight into and to adjust to the changing biological, social, and cultural conditions that confront them.

Although these social barriers are generally considered to be a product of urbanization and industrialization, both of the latter are the results of technological changes which began to revolutionize urban life in the 19th century and have now been extended to rural life as well. While it is still true that a rural environment is more suited than an urban one for satisfactory living in the older years, technological changes on the farm are also making successful adjustments more difficult there. In fact, in at least one respect the reaction of the aged to role changes may perhaps be less severe in metropolitan than in less highly urbanized areas, because of a greater degree of anonymity and compartmentalization of roles among urban dwellers, and a consequent lessened effect that the reduction in any one role has upon participation in others.

Social Adjustment

The criterion of social adjustment, for the purpose of this discussion, is the degree to which an individual is able to satisfy his personal needs and to accept the role and status accorded him by the value system of his community.

There are two types of adjustments confronting the individual in relation to his social roles: (a) that normally required by the social category to which the individual belongs, and (b) that resulting from a shift in role from one social category to another, which usually aggravates the attendant problems of adjustment.

The two problems are quite distinct. If, in the course of his life, a man remains in the same role, while other roles which were formerly subjectively rated on a parity with or beneath his own increase in prestige, he suffers a reduction in status, notwithstanding the fact that his role may have remained stationary or actually improved. Studies of role and status that do not penetrate beneath the objective facts to the changing evaluation of the culture and the subjective attitudes felt by those who participate in it have little to contribute to our understanding of human relations in general or aging in particular.

Space does not permit a review of the way in which these problems vary with regional, rural, rural nonfarm, suburban, urban, and metropolitan distribution or with position in the class structure, racial and ethnic origins, voluntary and involuntary retirement, financial ability, occupation, education, religious affiliation, family integration, self-identification with aging, and many other sociocultural factors.

Suffice it to say that there has been little investigation of the more fundamental sociological problems of these categories as evaluated by the community or by the aging persons themselves. Such an objective factor as decline in socioeconomic status, for example, is relatively easy to measure. It is valuable so far as it goes, but it is an inadequate index of the sociological problem of aging. It can only be interpreted in the light of the subjective attitudes of satisfaction or dissatisfaction of the person with his new role and status, and of the equally subjective cultural value system that conditions these changes.

As the research of Burgess has disclosed, even so objective a measure as a count of the activities participated in by the aged correlates but moderately with personal adjustment to aging, from which he concludes that "it is just as important, or even more so [to] get at the subjective reactions" and "self-conceptions of older persons" through their introspective reports of their attitudes and states of feeling as it is to study their objective situations (3).

Furthermore, these questions of attitude have as their correlates corresponding questions of value. To what extent, for example, do conceptions of the self as culturally derived affect

the adjustment of the aged? The available data indicate a significantly higher degree of maladjustment among those who identify themselves as old than among those who are in fact 70 or older. It has also been noted that those under 70 who identify themselves as old show a slightly higher ratio of maladjustment than those 70 and over who identify themselves as middle aged. It would seem, then, that although age identification is a factor in maladjustment, the importance of this factor cannot at present be assessed. The degree to which age identification is influenced by psychological factors resulting from such physiological and social changes as loss of mate or loss of role and status due to physical and mental deterioration is unknown. But one thing is certain, under the prevailing value system of our culture, to identify oneself with the aged is to accept a negative social evaluation of the self.

The simplest part of the sociological problem of aging, then, is to ascertain the objectively determinable physical needs of the aged (chiefly economic security, housing and medical care, and recreational and other leisure-time facilities), and to provide for them.

But knowledge about and suitable provision for the less tangible and more subjective socio-cultural needs present far more difficult problems for both social research and social action. Chief among these are needs associated with the more subjective values of religion, emotional security, personal independence, and social status and role. Among these the religious needs should be the easiest both to determine and to satisfy.

Retirement

The needs for independence and for social role and status present far different and more difficult problems. It is in these questions of social role and status that the sociological problems of gerontology chiefly consist.

Preliminary research, for example, indicates that it is involuntary retirement rather than financial ability per se that is associated with initial adverse reaction to retirement (4). Cavan and associates report that, other social categories being equal, old people who have had a hard life keep their faculties much better and

make a more realistic adjustment than those who have had an easier one (5). Nevertheless, voluntary and enforced retirement show a high correlation respectively with positive and negative attitudes toward that status. Voluntary retirement presents few problems of personal maladjustment in making the transition. But most of those forced into involuntary retirement undergo at least temporary maladjustment. Although financial ability or inability to retire seems to make little difference in the immediate adjustment to retirement, the financially able adjust more quickly than those who are compelled to find or to accept new sources of financial support (6a). The burden of retirement therefore rests most heavily on the lower classes, few of whom are able to retire voluntarily. Lack of regular activity is several times as prevalent here as in the middle and upper classes, and most of them desire to return to work. This is confirmed by the tendency of able-bodied retired workers to return to full employment when the opportunity to do so becomes available. Those who are physically unable to continue at their former occupations would rather transfer to less strenuous jobs with less loss of income than retirement would impose, bitterly as they may resent the loss of status involved. Prevailing cultural evaluations make it difficult for the worker to adjust to a lowering of status within the established hierarchy of employment roles.

There is no substitute for gainful employment for this group, both because of economic need and because their limited range of interests provides little motivation to engage in other forms of satisfying and creative activity. Such persons have little to retire to except retirement, owing to the difficulty of developing new interests and changing old habits. It is for these groups that the day care centers, such as the center sponsored by the New York City Welfare Department, fill an urgent need. Most of the clients of these centers are public welfare recipients, many of whom live alone or are left to themselves while other members of the families with whom they reside are at work. The department reports a notable reduction in the medical care needs of their participating clients, and not one case of hospitalized mental illness among the participants (7).

Three-Generation Family

During the depression, responsible citizens first realized that changes in the social structure of family and community life and in public opinion had been so great as to render the older conceptions of family care inadequate and difficult, if not impossible, to enforce legally. For in the traditional three-generation family the rights of the elders within the family circle stemmed less from the legal obligation of their offspring than from the force of custom and strong feelings of filial obligation. These feelings survive in European culture somewhat more strongly than in our own and are still recognized in the peasant concept of *Ausgedinge* or *Altenteil* (6b). As Mumford has said, "probably at no period and in no culture have the old ever been so completely rejected as in America during the past generation" (8).

It is this loss of role and status within the three-generation family that constitutes the sociological problem of aging. Any program for the aged that does not provide a community substitute for the range of vital interests and socially valuable functions provided by the traditional three-generation family is sociologically unsound. Many current developments in community planning for older people merely aggravate this problem. They provide a segregated community of beauty, order, and convenience, with excellent housing and recreational facilities and physical and medical services. But by congregating their clients (or should I say, their victims) in segregated communities, they further isolate them from normal interests and responsibilities.

No amount of amusements and hobbies, invaluable as they are in individual cases, can provide the savor of reality and the zest for life of normal participation in the activities of a mixed community, and restore to the aged the role and status, the social acceptance and self-respect they formerly enjoyed in the three-generation family at its best. Without these, the finest provisions for housing and physical care can furnish nothing more than a first-class ghetto. As the resident of one such model project complained bitterly, "All we do here is to wait for each other to die. And each time we say, 'Who will be next?' What we want is a

touch of life. I wish we were near shops and the bus station where we could see things" (8). Man is a social being with many nonphysical needs that can be satisfied only by active participation in the common life of his fellows.

We shall not have attained a healthy and socially mature society until we have developed roles for every age category in the community and a social status commensurate with the role performed. Nothing can provide the satisfactions of gainful employment for those able and willing to continue it.

In the increased leisure of those who have successfully adjusted to retirement or semi-retirement there exists a vast potential for public and social service which we have hardly begun to tap. But such voluntary services are little more than busy work unless they are integrated as essential parts of community life. They can provide their participants with a realistic sense of doing something that is important and valuable only if they are regarded by the community as having importance and value. For this group, it is especially important to lift the barriers to employment based on chronological age and to substitute capacity to function.

Prevailing Values as Barriers

An adequate and comprehensive program of social action on behalf of the aging must await the development of a new social philosophy and its incorporation into a new set of folkways and mores with regard to their capacities and needs. Even the limited research now available in these fields is not generally known. Consequently, public opinion and policy lag considerably behind even what we know. This lag is primarily due to the resistance of the prevailing value system with its emphasis on youth, speed, initiative, and inventiveness at the expense of such qualities associated with age as maturity of experience, judgment, skill, and reliability.

Unfortunately, this lag has been in part institutionalized in plans which implement the conviction that it is desirable to retire the older to make room for the younger workers with new ideas and eager for advancement. The accent on youth has found reinforcement in such sentimental slogans as Ellen Key's, "The twentieth century as the century of the child," and more

recently by such sociological fallacies as the famous definition of the family as a group of interacting personalities built up about the child, or the emphasis of child guidance workers upon the parent-child relationship as the most fundamental of human relationships, rather than the husband-wife relationship. For not only is the husband-wife relationship prior in time to the parent-child relationship, and more enduring, but it is a major factor in determining what quality of the parent-child relationship can exist.

Perhaps we are in danger of a corresponding distortion in our philosophy of aging by such verbal legerdemain as "the golden years," and "the best is yet to be." But to those who are experiencing the realities of the departure of children, loss of spouse and friends, impairment of health and vigor, reduction of income, and loss of role and status, there is nothing either golden or good. As one resourceful lady of 72 put it, "When one has given her life to serve others, first children and later other members of the family, and when they are gone and one is all alone—there is no longer any use to live, life has lost its meaning, there is no substitute" (9).

Indeed, such expressions may become occasions of further frustration. For as Cottrell has shown, the degree of adjustment to social roles which society assigns to its categories, including age, varies directly with the clarity with which such roles are defined. Lack of clarity and consequent maladjustment result from any "discrepancies between what is given verbally and what is demonstrated in practice" (10).

A fundamental reorientation in the prevailing value system is required, since the degree of adjustment to any role varies with the consistency with which others respond to one in that role (10).

Fundamental Philosophy

It is entirely proper to take a more optimistic attitude toward old age in general than is now current, but a realistic philosophy will pander to no hopes or sentiments that are incapable of practical realization. It will recognize four basic facts:

First, that there is an irreducible number of

the aged incapacitated for participation in any active program.

Second, that there are large numbers who are capable of sufficient rehabilitation to resume activities outside their homes.

Third, that some of these lack abilities or motivation for participation in activities beyond recreation and entertainment.

Fourth, that for many others there exists an urgent need for discovering and developing economically and socially productive roles offering opportunity for continuing, even if decreasing, individual satisfaction and status in the later years. One of the most distressing aspects of aging is maladjustment from frustration due to a culture that denies roles and status to which the aged are still entitled as a matter of right by their potential contributions to the common life. But the physiological changes of advancing years make changes in social roles ultimately inescapable.

Actions designed to facilitate shifts in roles will require much more extensive and detailed sociological research than is now extant. These must include:

1. The determination of roles appropriate to the disabilities involved.

2. Technical case and group procedures to assist the aging in the process of transition. A realistic understanding of the social worth of the new role must be developed, and the aging must have opportunities to identify themselves with these roles through intimate individual contacts, imaginative practice or dramatization, or actual participation.

3. And most difficult of all, a transvaluation of the prevailing system of values in our culture so that the new roles assumed by the aging may be appreciated. This is an essential basis for any program which the aged themselves can accept as realistic and satisfying.

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PHS Staff Appointments

Dr. James V. Lowry is the new chief of the Bureau of Medical Services, Public Health Service, with the rank of Assistant Surgeon General. Deputy chief of the Bureau since 1957, he succeeds Dr. John W. Cronin, who died in March 1958.

On June 1, 1958, Dr. Arnold B. Kurlander was appointed deputy chief of the Bureau; and on July 1, Dr. John C. Cutler became Assistant Surgeon General (Program Operations) in the Office of the Surgeon General, the post previously held by Dr. Kurlander. Dr. Cutler has been assistant director of the National Institute of Allergy and Infectious Diseases, Public Health Service, since the beginning of 1958.

Dr. Lowry's assignments in the Public Health Service, which he entered in 1937, have covered clinical medicine, research, and medical administration. After serving with the National Institute of Mental Health from 1947 to 1954 with the responsibility for the development of community mental health services, he spent 3 years as medical officer in charge of the Public Health Service Hospital in Lexington, Ky.

Dr. Kurlander, a member of the commissioned corps since 1940, served as tuberculosis control officer in the Arizona and Ohio State Health Departments and was assistant professor of preventive medicine at Ohio State University. He came to Washington, D. C., in 1950 as chief of the State Aid Branch, Division of Tuberculosis, Public Health Service, later becoming assistant chief of the Divi-

sion of Chronic Disease and Tuberculosis, and then chief of the Chronic Disease Program.

Dr. John C. Cutler entered the commissioned corps in 1942. Two early assignments were with the Public Health Service Venereal Disease Research Laboratory at Staten Island, N. Y., and the Pan American Sanitary Bureau for venereal disease research studies in Guatemala.

Subsequently, Dr. Cutler was detailed to the World Health Organization to direct a venereal disease control demonstration team in India.

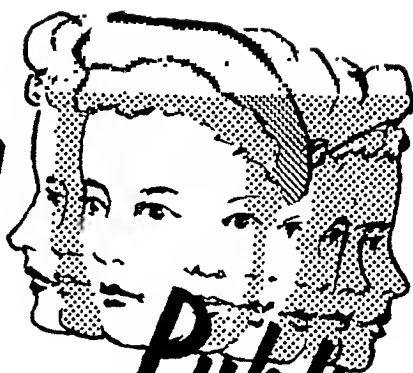
In 1951 Dr. Cutler became chief of the Technical Aids and Services Branch of the Public Health Service Venereal Disease Division, and in 1954, program officer working in planning and evaluation of specific disease control programs in the Office of the Chief, Bureau of State Services. Three years later he was named chief program officer for the Bureau.

M. Allen Pond, who has been on detail from the Public Health Service to the Office of the Secretary of Health, Education, and Welfare since 1953, was given the rank of Assistant Surgeon General on June 15, 1958. Mr. Pond is staff assistant to the special assistant for health and medical affairs in the Office of the Secretary.

Harry G. Hanson, director of the Robert A. Taft Sanitary Engineering Center, Public Health Service, Cincinnati, Ohio, was promoted to the rank of Assistant Surgeon General on June 1, 1958.

Priorities

in



Public Health Nursing

MARGARET G. ARNSTEIN, R.N., M.P.H.

THE PROGRAM of the health department seems more complex today than ever before, though a study of history might reveal that this is not a phenomenon of our age alone but a normal attribute of a changing, growing service, a situation to be welcomed rather than deplored. Indeed we would welcome new demands for services, new heights to conquer, if we only had enough staff to send up to each new mountain top. Shortage of people in the "service" occupations exists, however, and there is every prospect that it will continue to exist in the foreseeable future. We must therefore plan to use the available staffs wisely, wisely both in terms of the community's needs and

the staff's ability to meet those needs. Health workers, like all other people, need a feeling of satisfaction in a job well done; they should not perpetually feel frustrated by their inability to do all that they see needs to be done. This requires building priorities into our program plans.

The whole subject of deciding on priorities and acting on our decision has wide ramifications into all aspects of our lives. The differences in certain philosophies and religions is primarily a difference in what has priority. Psychiatry regards a person's inability to make a decision as a definite sign of mental illness. This indecisiveness is, in other words, the inability to give priority to one activity over another at any given instant. The person who suffers from this extreme of indecision often has to be hospitalized. But I wonder whether there are many of us at large who do not suffer from some degree of the same complaint. Be-

The paper is based on a talk given by Miss Arnstein at the June 1957 meeting of the New York State Public Health Conference, while she was chief of the Division of Nursing Resources, Public Health Service. Miss Arnstein is now the Service's chief of Public Health Nursing Services.

cause of it we say we are run ragged or exhausted by all the things we have been doing. How many of us have said at one time or another, "My workload is impossible!" "I can't do everything."

If I were a cartoonist I think I might draw the public health nurse as a beast of burden surrounded by people loading packages on her back, and more people in the distance coming with more packages. The labels on the packages are so familiar that I am not going to list all of them. We would see maternal and child health, tuberculosis, and school programs already securely tied in place, and heart, diabetes, and many others being added to the load. The caption on the cartoon would be "The public health nurse as she sees herself." In order to rescue this burdened, willing worker, we must decide what size load she can carry and then choose which bundles should go on her back on the first trip, and which on subsequent ones.

In this article, I would like to discuss the process of choosing which activities should have priority rather than discussing the activities themselves and trying to put them in rank order. Putting activities in order of rank carries the implication for me that there are times when some at the bottom of the list may not be reached.

The Selection Process

First we must consider what is involved in deciding which activity should have priority; then we must act on our decisions; and finally, we must feel satisfied with our actions—that is, we must not have guilty feelings that we have neglected something we should have done. Because each of these steps is progressively more difficult, most of us use escape hatches to save ourselves in the hope that somebody else will take the helm and spare us the trouble of plotting a course through the channel. One escape hatch is blaming someone else—the health officer, for instance, or the specialized consultant; in private life, our families or even our friends. Another is unwillingness to admit that there can be any priority: everything is of equal importance and must be done. The last method of dodging the priorities issue

often comes to the fore if one tries to help a friend or co-worker cut down on his workload.

Let us review the steps we go through sometimes unconsciously when we decide on priorities.

First, we must have knowledge: knowledge of the need for the activity; knowledge of what each action entails, why it is done, what the probable results will be if it is carried out, and what will happen if it is not; knowledge as to whether we are the only ones, or the proper ones to do it.

Second, we must have analysis: that is, seeing the separate facts we have gathered as a whole and in relationship to each other.

Third, we must have acceptance of the conclusions reached in the analysis. We have to believe emotionally as well as intellectually that the decisions are right. This is particularly difficult if someone else did the analysis, for example, if the health officer, or someone in the State health department passes on the results of his analyses to the local nurse who has to carry them out.

Fourth, we must feel as competent to carry out the programs given top priority as those given low priority. This is a crucial requirement when a major change in priorities occurs. If we don't feel equally competent in both areas we have to take steps to become so. If all these steps have been taken then the ultimate goal—action—will result.

Finally, we have to feel satisfied with the activities performed according to the priorities decided upon, and satisfied with those not performed because time did not allow us to get that far down the list. This feeling of satisfaction depends not only on our acceptance of the decisions we have made, but also on our own personalities.

Everyone has a need to be loved and some people need constant reaffirmation that they are loved. For many, this means that they are approved, that all their actions are approved by everyone, that they live up to the ideal they have set for themselves, and that they think others have set for them. We call these people perfectionists. Obviously when we use these terms to describe a perfectionist his goals become ridiculous. No one can please everyone all the time. In terms of the subject of this

article, no matter which actions we give priority to there will be some who think our analysis was wrong, or our judgment was poor, or if we had just applied ourselves more diligently we could have completed the whole list. As nurses we are particularly sensitive to this type of criticism. We—the majority of us—entered nursing to help people. All the studies to date have shown this to be the outstanding motivation. Society thinks of us as helping people and a helping person should help. She should not say “no” or suggest that someone else can do the service needed.

An example from our out-of-office lives illustrates these steps though we are not, as I said, usually conscious of going through them. The following activities have been proposed for a Saturday by someone, ourselves or others: (a) pay bills; (b) clean the house; (c) go swimming; (d) write a paper for *Nursing Outlook*. (There would be other activities on the normal Saturday list but this will do for purpose of illustration.)

What are the facts? That is, what is the need for the action, and what are the results if the activities are done or left undone?

pay bills?

Facts: There are 8 bills to be paid, received almost 1 month ago. Our credit rating is now A.

Results: If the bills are paid, credit rating stays high; if not paid, credit rating might drop but this is unlikely on the basis of 1 month's lapse.

clean the house?

Facts: It is dusty, the wastepaper baskets are half-full, it is in disorder. We have a rule that the house should be cleaned at least once a week.

Results: If the house is cleaned, dust and dirt will not be ground into fabrics and they will last longer; our aesthetic senses will be gratified. If the house is not cleaned, some day in the future we will have to replace the fabrics X number of years sooner; we will have less pleasure in looking at the house; the wastepaper may overflow, which is a nuisance.

go swimming?

Facts: This is a healthful exercise. The weather is hot. We have just read an article by Dr. Paul Dudley White—who is an authority—that exercise is important in maintaining health.

Results: If we swim we will feel fine, refreshed, and enjoy ourselves, but we may feel guilty or stay up half the night doing the other things on the list. If we don't swim, we will not get refreshed, may not do other things well, will resent our decision (or when younger, our mother's decision).

write the paper?

Facts: We promised the paper by July 1. Only 1 week is left; we have 1 free half day in the office next week.

Results: If the paper is completed, we will have great sense of accomplishment, appreciation from editors for promptness; when the paper is printed, our ideas will have an influence on others and also get recognition from co-workers. If we don't write the paper, we can do some of it in the office, can get it in late and be criticized by the editors, or can risk later publication.

Then comes the complicated analysis of the relationships of all of these facts to each other, and judgment enters in because there are no statistical measures. There is no one index marked “Satisfactory Saturday.”

This is the action which might be taken on the basis of the analysis of the facts. We decide to empty the wastepaper baskets but let the rest of the house cleaning go. The facts about the relationship of dirt to length of life of the material are not clearly proved; many other factors enter in. Aesthetics are not so important as we will either be swimming or writing the paper or paying bills. We decide we can pay some bills, then we will have time to pay the rest next week. We will swim, and start the paper in the office and finish it next weekend if necessary.

We can follow this same process in making a home visit. We are all familiar with the admonition to start our health supervision visits with the family's interest, meet their needs first. We have a harder time when it comes to teaching them the procedures we learned in our

schools of nursing. There are no priorities here; every step is equally important, or at least that is the way we often were taught.

It is not easy to decide which single thing one would teach a family if only one thing could be absorbed by them. It is a very good exercise to think about priorities in this way. After deciding what should come first, think what should be taught second if only two things can be taught, and so on.

For example, the public health nurse visits a household where she finds this situation: Mike, age 12, has a streptococcal sore throat. John, age 10, has previously had rheumatic fever. The boys sleep in the same room. In her background of knowledge, the nurse has specific facts about rheumatic fever and streptococcal infections. She analyzes these and forms a judgment. Priority 1 is to keep the boys apart. Priority 2 is to keep John taking prophylactic penicillin. By the time she has helped the family work out alternate sleeping arrangements for John, various ways of making sure he doesn't go into the room to play or to get something, the family's time and concentration powers have run out. So she does not teach anything further in this visit about the isolation technique, she says nothing about boiling dishes and burning paper handkerchiefs, for she has decided these have lower priority at this time. Nor does she mention anything regarding diet and care for Mike. Obviously we could go into much greater detail and discuss why she chose these priorities and whether or not we can agree with her. But stated in brief, this case is just one illustration of the omissions which must occur at times when one plays the priority game seriously.

This analysis of what is most essential in any given situation or procedure and why it is priority 1, 2, or 10 could be an important part of our teaching in the basic professional schools of nursing. It would help sharpen our thinking to consider why we do the things we do and their relative importance under varying conditions.

The Community Program

When we apply these steps in planning a public health program for the community, we

again get the facts first. We are on familiar ground in this first step. We know we must find out what the most important health problems of a community are before we develop a specific plan of action. We are accustomed to looking at mortality data and morbidity data when the latter is available. Today in most communities in this country we would find diseases of the cardiovascular system at the top of the list, with cancer and accidental deaths among the top five. Maternal and infant mortality would be at the bottom along with deaths from the acute communicable diseases. This is one set of facts about needs of the community, but there are others which may be in conflict just as there were in the activities for a Saturday in summer which I mentioned earlier.

There are facts about the interests and demands of various groups in the community. The school principals want a health program for the school children. The physicians want nurses to give injections in the homes—to their patients with anemia, allergies, or infections. The parents want poliomyelitis "shots" for their children and perhaps themselves.

The special consultants from the State health department are each pressing us to put our efforts into such different programs as positive health guidance for mothers and children, care of the posthospitalized tuberculosis patient, care of the posthospitalized mental patient, heart disease and cancer control programs, supervision of the health of the aged, especially in nursing homes, reemphasis on immunization against diphtheria and smallpox.

There is another set of facts we gather, and that is information about the community resources available to meet some of the needs revealed by the facts already listed. We are not alone; we need not try to do the whole job ourselves.

We find the Junior Chamber of Commerce has started a hospital program of recreation for older citizens; the tuberculosis and public health association used to be very active but has not done much recently; the local heart association has just been organized; the Junior League is working in the hospital outpatient department; there are a number of inactive nurses living in the community.

Although the above listing presents a com-

plicated picture, it is not nearly as complex as a real community would be. Obviously the analysis of these facts and their relationship to each other in order to arrive at priorities in our program will require time, thought, and judgment. When all factors had been taken into consideration we would probably find that no program activity would be completely ruled out. We would do part of each, giving more time—more priority—to some than to others just as we did when planning our Saturday's activities.

Our priority plan would help us in meeting pressures for more of any given service. If it had a low priority, the group exerting the pressure would have to show why this service should be moved higher in the list, thus automatically depressing other services.

This does not mean that the plan made at the beginning of the year, the beginning of the week, or even the day's plans can always be followed. In health work there are always emergencies; there are always unexpected demands. It may be poliomyelitis vaccination

clinics, or an influenza epidemic, or a special study of new drugs for home treatment of some disease which claims our attention. These may have to take priority for short periods over all other activities in our program plan. When this happens the decision has often been made by someone else, but if we understand the reason for the decision we can accept it and give it first consideration in our own minds.

In summary, in order to establish priorities we first must have knowledge based on facts and experience; we must make an analysis of the relationships of the various facts; then, because there are no mathematical formulas to show us which activity should have priority, we must use judgment in the interpretation of our analysis. The action we take, the program we carry out, is the result of the above procedures. We can then go home—if we have dealt with our personal need to please everyone—at the end of each day, at the end of each year, satisfied that, according to our best knowledge and judgment, what has been left undone was less important than what has been done.

U. S. Injury Estimates, July–December 1957

During the last half of 1957 about 25 million Americans were injured seriously enough to require medical attention or to limit their activities for at least a day, according to a preliminary report by the Public Health Service's U. S. National Health Survey.

Injuries during this period resulted in almost 214 million days of restricted activity, including 55.5 million days spent in bed at home or in a hospital. The report also shows:

- Home accidents injured 10,065,000 people, or 40.3 percent of all injured.
- Work accidents injured 4,173,000, or 16.7 percent.
- Motor vehicle accidents injured 2,444,000, or 9.8 percent.
- Other kinds of accidents and injuries resulting from violence involved 8,267,000, or 33.1 percent.
- Of the total injured, 14.1 million were males and 10.8 million, females; 14.9 million were urban residents; 7.1 million lived in rural nonfarm areas; and 3 million lived on farms.

The Preliminary Report on Number of Persons Injured, United States, July–December 1957 is the third in a series based on continuing nationwide household interviews, conducted for the Public Health Service by the U. S. Bureau of the Census.

Budgeting a Combined Health Department

A. D. SIDIO, M.S., and JOHN S. ANDERSON, M.D.

MERGING separate city and county health departments into one organization results in certain advantages, but specific obstacles must be overcome before the combined unit can be considered successful.

The foremost problem confronting any such combined department is that of obtaining an adequate budget. This is sometimes complicated by the city and county governments' differing on the amount each should contribute to the health department budget. Theoretically, the amount should be worked out between the two governments without any help or hindrance from the health department. When agreement is lacking, however, the department may find itself in the unwanted but necessary position of arbitrator, especially if lack of agreement threatens dissolution of a combined unit before there has been sufficient opportunity to demonstrate the advantages of combination.

The Pueblo City-County Health Department in Colorado was organized in July 1952. By written agreement, the city and county of Pueblo gave the new department the balance of the funds unexpended from the budgets of the former health departments, with which the new department was to operate until January 1953. Unfortunately, the written agreement between the city and county of Pueblo, permitting the formation of the department, contained nothing concerning the future financing of the de-

partment. This was a serious oversight, for the city and county governments had diametrically opposite viewpoints on the matter.

Pueblo County has a population of about 120,000. Approximately 80 percent of the population is in the city of Pueblo. There are only two, very small, incorporated communities in the county besides Pueblo. Most of the remaining population is in the fringe around the city of Pueblo.

City and County Debates

Before 1952, the county health department consisted of two nurses, a sanitarian, and a part-time health officer. Compared with the city health department, the operation was small. After the merger, the county government reasoned that its share would be proportionate to the population of the county excluding the city of Pueblo.

The city government postulated that since the residents of the city paid county taxes, they should expect to get health services from the county. In the city's opinion, it would be logical for the city to withdraw all its contributions and let the county assume the entire operation of the health department. The county countered by explaining that since the people of the city lived in a congested area, they had more public health problems, would need more health department services, and should expect to contribute more to the budget.

This debate continued each time the health department budget was presented from 1952 to 1956. Much time was wasted by all concerned. In 1955, the health officer went to 10 meetings in which the proportionate share of the budget was the only item discussed. Each year, some

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Public Health Reports

kind of compromise was reached; yet neither government felt that the arrangement was equitable.

In 1956, a complete impasse was reached in what had now become the routine annual health department budget conferences. Everyone had grown weary of hearing the same arguments over and over again without resolution. The inability of the two governments to reach agreement had nullified the otherwise increased efficiency of the health department. The dissolution of the combined department was imminent.

Devising a Formula

At this crucial moment, the department found it necessary either to assume the undesirable position of arbitrator or to see several years of hard work and progress go for naught. An attempt was made to express in mathematical terms population, taxes, and services within the city and county area outside the city. Population was eliminated as a necessary ingredient in the formula since for several reasons the services were not given on a proportionate basis. For example, the department provided the school nursing program in the county area, while the city schools had continued their own nursing program at the time. The idea was that, if the formula could correlate the extent that the city population was taxed with the amount of health services they received, the city's share of the budget could be determined equitably.

The formula, as originally presented to simplify explanations, was as follows:

$$C + E_c (B - C) = S_c B$$

where

C = The city's share of the health department's budget.

E_c = The assessed valuation of the city, expressed as a percentage of the total county valuation.

B = The net budget to be divided between the city and the county. (State contributions, income on vital statistics, and other funds would be subtracted from the gross budget to obtain the net budget.)

$(B - C)$ = That part of the budget paid by the county.

S_c = The percentage of the health department services provided inside the city.

The left side of the formula is the entire amount paid by the city, the funds coming

from the city's separate contribution and from the county for the county taxpayers living in the city. The contribution by the city subtracted from the total net budget represents the amount paid by the county. When the amount paid by the county is multiplied by the percentage of the county valuation inside the city, the portion of county taxes collected from the city residents is accounted for.

The right side of the formula represents what the city receives for the moneys paid. If the city receives a certain percentage of the services of the health department, then it is obligated to pay that percentage of the budget. This also holds true for the county. The formula is based upon each paying for the services received.

A similar formula could be worked out to determine the county's share, but this would be unnecessary. The formula is set up to determine the city's share of the budget, and the county's share can be determined by computing $(B - C)$.

Calculating the City's Share

Except for S_c , all factors in the formula were known. The percentages of services provided in the city (S_c) could be determined from the daily activity reports in the Pueblo City-County Health Department. Statistically, this figure can be determined within reasonable accuracy without adding appreciably to the time required to prepare daily activity reports. The department personnel had been preparing activity reports for several years, although no differentiation between city and county work was made prior to January 1, 1956.

The manner in which the services given to the city is calculated seems complicated, but actually it is very simple administratively. Each person in the field codes the number of hours spent for the city and county. Office time and time spent on activities that cannot be conveniently broken down into city and county components are ignored, since they should be proportionate to the time spent on the various activities in the field.

General expenses, such as the health officer's salary and commodities used by the entire department are assumed to be proportionate to the division of the field services. Since field services were coded in the past, it did not add to the

department's administrative effort to code for the city and county breakdown.

For example, during the month of June, sanitarian "A" spent 87 hours for the city and 30 hours for the county in the field, thus 74 percent of his services were allotted to the city and 26 percent to the county. The entire division of sanitation field services were coded and tabulated in a similar manner. For the month of June, the department spent \$1,599.81 for salaries and retirement for the sanitarians doing work in the city. This was 69 percent of the total. In addition to the sanitarians, the sanitation section has other expenses such as the supervisor's salary, the secretary's salary, automobile expenses, vacation and sick leave, and laboratory expenses. All the above expenses are prorated by 69 percent and charged to the city. The sanitation section expended \$2,402.26 (69 percent) for the city and \$1,079.28 (31 percent) for the county during the month of June 1956.

The same procedure is used for the nursing, meat inspection, and vital statistics sections. These are the services that can be accurately divided into city and county components. The expenditures of each of these sections, according to the city and county divisions, are then totaled. In June, this amounted to \$6,505.11 (66 percent) for the city and \$3,327.20 (34 percent) for the county.

With the calculations for S_c completed, all factors in the formula were known.

Explaining the Formula

Our first problem, after we had established the validity of the formula through several critical reviews, including a legal review, was to explain the formula to officials unaccustomed to thinking in algebraic terms. The first step was to transpose the formula in order to show the city's share of the health department's budget. Thus:

$$C = \frac{B(S_c - E_c)}{1 - E_c}$$

Hypothetical values were then substituted for

the symbols in our explanation. For if the city had 50 percent of the assessment and the health department was given city 50 percent of its services, then the government should not be required to supply additional money to the department. As that the budget is \$100,000, then

$$C = \frac{\$100,000 (0.5 - 0.5)}{1 - 0.5} = \frac{\$100,000 \times (0)}{0.5} =$$

If, however, the assessed valuation remained at 50 percent, but the city receives more services, then the city would be required to provide additional funds. Assuming that the net budget remained at \$100,000 and the city received 75 percent of the health department's services, the city's additional obligation can be determined:

$$C = \frac{\$100,000 (0.75 - 0.5)}{1 - 0.5} = \frac{\$100,000 (0.25)}{0.5} = \$50,000$$

As the result of our efforts to devise a formula and our success in explaining it, both city and county governments agreed that the formula provided a fair and equitable means of determining their share of the budget. A contract incorporating the formula was prepared and signed by both parties.

Conclusion

It is felt that this formula can be used successfully by other departments. The type of service will vary with each department, but the coding procedure can be adapted to meet the individual situations with ease.

The formula would be particularly applicable to combined departments where more than one governmental unit contributes to the budget. This would be true where several counties were combined into a district health department or where several cities within the jurisdiction of a county health department are expected to contribute to the department budget. The use of the formula should tend to eliminate much unnecessary work for those seeking approval for combined health department budgets.

Hospital records show that accidental injury is the chief cause of hospitalization, followed by hernia, heart disease, and tuberculosis. Leading causes of deaths are malignant neoplasms and heart disease.

Health Problems of American Seamen as Measured by Hospital Statistics

ROBERT W. BARCLAY, A.B., and EDYTHE A. GRAY, A.B.

THE HEALTH of seamen has long been a matter of concern to major maritime powers. In the United States, Congress authorized the President "to provide for the temporary relief and maintenance of sick or disabled seamen" in 1798, making merchant seamen the first group in this country eligible for medical care through Federal legislation. This action by Congress gave support to an industry that was an integral part of our national defense forces and vital to our foreign trade. At the same time, it provided the means for coping with a public health problem.

To a considerable degree, the public health problem of itinerant seamen without community ties has diminished. Living conditions on ships at sea and in boarding houses ashore have improved dramatically over those chronicled at the turn of the century. But seamen today continue to constitute a unique group whose occupation warrants special consideration of their health problems.

The merchant marine, long recognized as the "fourth arm of defense" and essential to foreign trade, is also an industry that requires a

high degree of risk to the health and physical well-being of its labor force. Seamen must undergo exposure to diseases through foreign travel as well as the health hazards of ship-board life. Close confinement and lack of professional medical attention for long periods when vessels are at sea are factors which can have far-reaching influence on health. In port, the seaman is frequently in need of medical care in a location many hundreds of miles from his home. For these reasons the United States and other maritime nations have seen fit to make special provision for the health needs of seamen.

Since seamen crews of merchant vessels are world travelers, national interest in the health of seamen has led to international recognition of the problem. In the early 1800's the United States Congress authorized the care of seamen from foreign-flag vessels in our marine hospitals, as they were then known, at the expense of the shipping operator. With the development of wireless communication, a program of medical advice to ships at sea was adopted that is today virtually worldwide. Lists of international venereal disease treatment facilities have been published for many years. More recently, a Joint International Labor Organization-World Health Organization Committee on the Hygiene of Seafarers has been formed.

In the United States, medical care is pro-

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vided for all seamen actively engaged in their occupation on American-flag vessels. Seamen with 60 days of continuous sea service are eligible for medical care while actively engaged in this work and for a 90-day period following their last sea service. We estimate that the number eligible for health services who were employed on vessels navigating the deep seas, the Great Lakes, and coastal and inland waterways averaged 162,500 in 1956 and 166,000 in 1957. (The year here and elsewhere in this paper refers to the Federal fiscal year, July 1-June 30. The estimate of employees is based on data in the Maritime Manpower Report and other information from the Maritime Administration in the Department of Commerce, the Fish and Wildlife Service in the Department of the Interior, and the American Waterways Operators, Inc.)

Seamen on American-flag vessels receive inpatient and outpatient medical and dental care through a network of Public Health Service facilities that also minister to the health needs of Coast Guard personnel, Federal employees with a job-related, compensable injury or illness, and several other categories of beneficiaries. The facilities used by seamen include 12 general medical and surgical hospitals, a tuberculosis hospital, and 2 neuropsychiatric hospitals. In addition, 26 outpatient clinics staffed with full-time personnel are operated in ports along the seacoasts and waterways in this country and its possessions. In another 98 locations, where the caseload does not warrant a full-time activity, care is supplied through contracts with private physicians for part-time service. Outpatient facilities are authorized to use local hospitals in emergency situations until patients can be transferred to the nearest Public Health Service hospital. Seamen receive about 40 percent of the total volume of care provided by these facilities. The following data indicate the level of utilization for seamen:

| | 1956 | 1957 |
|---------------------------|---------|---------|
| Inpatient admissions..... | 24,184 | 25,104 |
| Average daily census..... | 2,359 | 2,369 |
| Inpatient discharges..... | 23,967 | 24,658 |
| Outpatient visits..... | 438,000 | 454,973 |

It would be difficult to compare these gross measures of health services with standard or

average hospital utilization rates for the general population. The precise age-sex composition of the seaman labor force cannot be ascertained, and little is known about the extent to which seamen use health services outside Public Health Service auspices. These factors, however, do not preclude the development of a considerable quantity of informative material through analysis of hospital morbidity and mortality statistics. The causes of hospital admission and of hospital deaths are valid indicators of the major health problems of seamen. These data are reported to Washington for each patient discharged by Public Health Service hospitals and contract facilities. Information for seamen discharged in 1956 and 1957 forms the primary source of the data which follow. Ninety-nine percent of the patients were men. More than four-fifths were white; Negroes accounted for 10 percent, and another 3 percent were of other ethnic groups.

Causes of Hospitalization

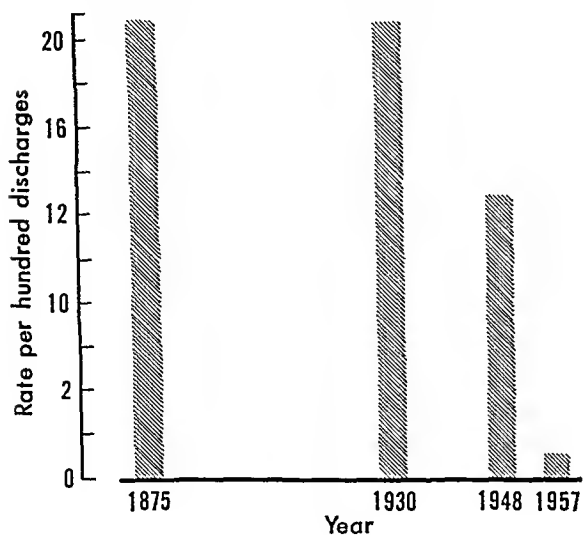
Injuries due to accidents head the list of causes for admission of seamen to hospitals. Other most frequently named causes are hernia, heart disease, tuberculosis, ulcers, and malignant neoplasms (table 1). These conditions

Table 1. Leading causes for hospital admission among seamen discharged from Public Health Service and contract hospitals, 1956 and 1957

| Cause for hospitalization | 1956 | | 1957 | |
|------------------------------------|--------|-------------------------|--------|-------------------------|
| | Number | Rate per 100 discharges | Number | Rate per 100 discharges |
| All causes..... | 23,967 | 100.0 | 24,658 | 100.0 |
| Accidents (800-999)..... | 3,173 | 13.2 | 3,385 | 13.7 |
| Hernia (560-561)..... | 1,465 | 6.1 | 1,614 | 6.5 |
| Heart disease (410-443)..... | 1,424 | 5.9 | 1,376 | 5.6 |
| Tuberculosis (001-019)..... | 1,173 | 4.9 | 1,204 | 4.9 |
| Ulcers of stomach (540-542)..... | 768 | 3.2 | 752 | 3.0 |
| Malignant neoplasms (140-205)..... | 756 | 3.2 | 739 | 3.0 |

NOTE: Figures in parentheses are category numbers of the International Statistical Classification, 1918.

Figure 1. Hospitalization of seamen for venereal disease, Public Health Service and contract hospitals, selected years.



represent the cause for about one-third of the hospitalizations of seamen, and they account for slightly less than one-half of their total days of hospitalization each year.

Injuries due to accidents were the cause of hospitalization for more than 13 percent of the discharged patients in 1956 and 1957. The high standing of this category among the conditions leading to hospital admission is a reflection of the hazardous nature of the seaman occupation. In its Accident Facts for 1957 the National Safety Council reports that the marine transportation industry had the highest rate of disabling injuries (number of injuries per million man-hours) among 40 major industry groups. The 3,173 seamen discharged in 1956 following hospitalization for treatment of injuries included 989 patients with fractures (excluding those of skull and face bones and fracture residuals); 812 with open wounds, contusions, and the like; 614 with dislocations, sprains, and strains; 371 with intracranial injuries; and 387 with other injuries.

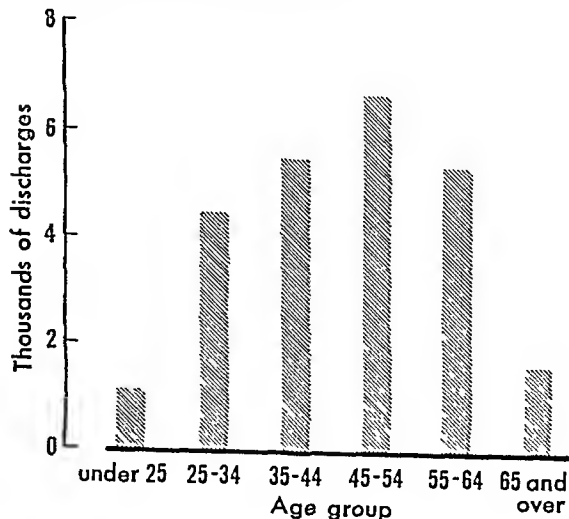
There has been little change in the relative frequency of injuries due to accidents as a cause of hospital admission among seamen during the past 10 years. This condition has ranked first since the late 1940's. Before then, however, venereal disease was the most frequently named cause of hospital admission. There were entire

wards set aside in Public Health Service hospitals for long-term treatment of syphilis. With the introduction of penicillin, hospitalization of seamen with venereal diseases was sharply curtailed. Although approximately the same number of seamen were discharged from hospitals in 1930 and in 1957, admissions for venereal disease amounted to more than 5,000 in 1930 as compared with 265 in 1957. As recently as 1948, venereal diseases have accounted for a substantial share of the hospitalizations of seamen (fig. 1).

The list of leading causes for hospitalization of seamen reflects some conditions traditionally associated with the maritime industry, such as accidents and tuberculosis. It also includes two relative newcomers, heart disease and malignant neoplasms. The number of seamen with these latter conditions indicates that the average age of the seamen labor force is increasing. This indication is borne out by analysis of the age distribution of the seaman discharged from hospitals. Between 1948 and 1957 the median age increased from 37.9 to 47.0 years; in 1957, seamen 65 years of age and older outnumbered those under 25 years of age (fig. 2).

The frequency rates for the leading causes of hospital admission vary considerably according to the age of the patients. Accidents represent a relatively small share of the conditions treated among older patients, who tend to have

Figure 2. Age at time of hospital admission of seamen discharged from Public Health Service and contract hospitals, 1957.



substantially more heart disease and malignant neoplasms (table 2).

Seamen treated only for accidental injuries during a period of hospitalization had an average length of stay of 17 days in 1956. This compares with 15 days for seamen with a diagnosis of hernia, 23 days for those with heart disease, 111 days for those with tuberculosis, 20 days for those with ulcers, and 35 days for those with malignant neoplasms. These figures are based on single-diagnosis cases not requiring further immediate hospitalization. Transfer cases are excluded.

These differences in length of stay for the leading causes of hospital admission and the variation with age in types of conditions treated help to explain why older seamen tend to be hospitalized for longer periods than younger ones. Other factors are contributory, however. Older patients tend to be treated for more conditions per hospital admission than younger seamen and to remain hospitalized longer even for the same conditions. The variation in length of stay by age group is shown below:

| Age (years) | Median stay (days) |
|-------------------|-----------------------|
| All ages..... | 17 |
| Under 25..... | 10 |
| 25-34..... | 13 |
| 35-44..... | 15 |
| 45-54..... | 18 |
| 55-64..... | 22 |
| 65 and older..... | 23 |

Causes of Hospital Deaths

A total of 518 hospital deaths were reported for seamen in 1956 by Public Health Service hospitals and contract facilities. Of this number, 208, or 40 percent, were attributed to malignant neoplasms. The next most frequently named cause was heart disease, which accounted for 109, or 21 percent, of the hospital deaths (table 3).

For all males in the general population, heart disease is the leading cause of death, both in and out of hospitals. Heart disease deaths far outnumber the deaths attributed to malignant neoplasms. This same relationship is observed among male patients dying while hospitalized under the Saskatchewan Hospital Service Plan.

Table 2. Leading causes of hospitalization for seamen, by age: rate per 100 discharged patients, Public Health Service and contract hospitals, 1956

| Cause for hospitalization | Age at time of admission (years) | | |
|---------------------------|-------------------------------------|-------|-----------------|
| | Under 45 | 45-64 | 65 and older |
| Accidents..... | 17.6 | 10.1 | 5.8 |
| Hernia..... | 4.6 | 7.7 | 5.2 |
| Heart disease..... | 1.6 | 8.5 | 17.6 |
| Tuberculosis..... | 4.2 | 5.5 | 4.0 |
| Ulcers of stomach..... | 3.2 | 3.5 | 1.3 |
| Malignant neoplasms..... | 1.0 | 4.3 | 10.0 |

NOTE: For International Statistical Classification numbers for cause categories, see table 1.

Of 1,853 male deaths reported by general hospitals of Saskatchewan in 1951, 447 were the result of malignant neoplasms as compared with 532 caused by heart disease. Among the seamen included in our study, however, the number of deaths from malignant neoplasms is almost twice the number of deaths attributed to heart disease. (The Saskatchewan data were supplied by the Division of Public Health Methods, Public Health Service, which obtained them from the Saskatchewan Hospital Service Plan.)

This difference is probably explained by the effects these diseases have on the employment pattern of seamen. Seamen with heart disease

Table 3. Hospital deaths among seamen, by age, Public Health Service and contract hospitals, 1956

| Cause of death | Age at time of admission | | | |
|-------------------------------------|--------------------------|-------------|-------|--------------------|
| | All ages | Under 45 | 45-64 | 65 and older |
| All causes..... | 518 | 73 | 332 | 113 |
| Malignant neoplasms (140-205)..... | 208 | 23 | 139 | 46 |
| Heart disease (410-443)..... | 109 | 7 | 72 | 30 |
| General arteriosclerosis (450)..... | 27 | 0 | 15 | 12 |
| Cirrhosis of liver (581)..... | 26 | 2 | 19 | 5 |
| Tuberculosis (001-019)..... | 18 | 3 | 11 | 4 |
| All other..... | 130 | 38 | 76 | 16 |

NOTE: Figures in parentheses are category numbers of the International Statistical Classification, 1948.

which is not rapidly progressive to death become unfit for duty at sea and consequently lose their eligibility for medical care. The end result of the disease in these patients is not reflected in these figures. Malignant neoplasms, however, frequently cause relatively quick death. Hence, many more seamen with malignant neoplasms than with heart disease are likely to be eligible for care throughout the course of their disease.

That the older seamen tend to leave the labor force is indicated by a comparison of the ages of hospitalized seamen and of Saskatchewan males. In Saskatchewan in 1951, the proportion of discharged patients 65 years of age and older was 20 percent. The corresponding figure for the seamen in our study was less than 7 percent.

Adjusting for the difference in ages between the seamen and the Saskatchewan males would not change the picture substantially. Of the deaths of seamen aged 45-64 years, 139 were attributed to malignant neoplasms and 72 to heart disease, still a ratio of 2 to 1. The number of deaths due to malignant neoplasms among Saskatchewan males in this age group was 130 as compared with 139 for heart disease.

Another comparison for discharged patients aged 45-64 years, however, shows that the proportions of hospital admissions for malignant neoplasms were approximately the same among seamen and Saskatchewan males. Heart disease, on the other hand, was the cause of hospitalization for a greater proportion of the seamen (table 4).

These data support the hypothesis that seamen with heart disease leave the maritime labor force and thereby lose their eligibility for medical care. The fact that deaths due to malignant neoplasms far outnumber those caused by heart disease among seamen receiving medical care in Public Health Service and contract facilities cannot, therefore, be interpreted as evidence of an association between the seaman occupation and malignancies.

Tuberculosis, like malignant neoplasms and heart disease, ranks high as a cause of death

Table 4. Malignant neoplasms and heart disease among hospitalized seamen and Saskatchewan males aged 45-64 years

| Cause for hospitalization | Seamen | | Saskatchewan males | |
|---------------------------|--------|--------------------------------------|--------------------|--------------------------------------|
| | Number | Rate per 100 discharges ¹ | Number | Rate per 100 discharges ² |
| Malignant neoplasms | 491 | 4.5 | 561 | 4.4 |
| Heart disease | 973 | 9.0 | 1,029 | 8.1 |

¹ Based on total of 10,842 discharged patients, excluding tuberculosis patients.

² Based on total of 12,780 patients discharged from general hospitals.

as well as a cause of hospitalization. In 1956, 18 deaths among hospitalized seamen were attributed to tuberculosis, about 3.5 percent of the total hospital deaths. This figure is considerably smaller than the proportion in past years. Tuberculosis accounted for 15 percent of the hospital deaths among seamen in 1948 and 5 percent in 1954.

Summary

Examination of morbidity and mortality statistics from Public Health Service hospitals and contract facilities indicates that accidents, hernia, heart disease, tuberculosis, ulcers, and malignant neoplasms are today the major health problems of American seamen. These conditions represent the cause for about one-third of all hospitalizations of seamen and account for slightly less than one-half of the days of inpatient care they receive.

Venereal disease, once the leading cause of admission to hospitals among seamen, has virtually disappeared as an illness requiring inpatient care.

Malignant neoplasms and heart disease are named as the underlying cause for 60 percent of the hospital deaths. Deaths due to tuberculosis have decreased sharply from levels of a few years ago.

Association of Bats with Histoplasmosis

CHESTER W. EMMONS, Ph.D.

TWO YEARS ago, a family moved into an old frame dwelling in a rural neighborhood near Clarksburg, Md. Shortly thereafter several members of the family became ill with histoplasmosis. The number of bats living in the attic of the house, the quantity of bat guano in the attic and on the ground adjacent to the foundation walls, and the isolation of *Histoplasma* repeatedly from all four sides of the house out to a distance of 5 feet suggested the source from which one fatal and several clinical illnesses in the family were acquired. A clinical report of this outbreak will be made separately.

The environmental conditions associated with this family epidemic may be significant in explaining the epidemiology of certain cases of histoplasmosis occurring in rural families. They may be especially significant in explaining the puzzling distribution of histoplasmin sensitivity and cases of histoplasmosis in certain towns and cities where there is no known association with chickens and where saprophytic sources of *Histoplasma* have not yet been detected.

The saprophytic growth of *Histoplasma* in soil is so frequently associated with chicken excreta that it receives the immediate attention of the epidemiologist confronted by a case of histoplasmosis. The patient is questioned carefully concerning the presence of chickens in his environment and the extent of his exposure to them. Any episode involving removal of litter

and excreta from a chicken house, or its use as a fertilizer on garden or lawn, is at once assumed to have provided the effective exposure. Laboratory isolation of *Histoplasma* from the material under suspicion often strengthens this assumption. However, a preoccupation with the patient's exposure to chicken excreta may lead to oversight of other associations which can be equally important but which have not received general recognition.

Zeidberg and associates (1) first called attention to the association between chickens and the saprophytic growth of *Histoplasma* in soil fertilized by their excreta. The first isolation of *Histoplasma* from soil was from a specimen collected under a chickenhouse, although the building was not identified in the report (2). This association has been widely recognized and confirmed by many investigators. Many isolations of *Histoplasma* from sites not associated with chickens have been reported, however. These include the earthen floor of a meathouse, miscellaneous farm buildings and a dog pen (3, 4), an old unused silo (5, 6), river water (7), a storm cellar, an old water tower, an old chalk mine, soil under a residence, low moist woodland, an abandoned schoolhouse (8, 9), and a hollow tree trunk (8-10).

One recognized association has been with caves known to be sources of infection for speleologists, casual visitors, or persons working in caves in the mining of guano or collection of other materials. In 1948, Washburn, Tuohy, and Davis (11) reported pneumonitis occurring in persons entering a cave. It is not reported whether bats were present. They called this disease "cave sickness" and suggested that it was a new disease entity. The patients did not re-

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act to histoplasmin or coccidioidin down to dilutions of 1:100 and 1:10, and no complement-fixing antibodies to these antigens could be shown in any of the 21 persons who became ill. On the basis of X-ray appearance, symptomatology, and one isolation of *Histoplasma* from the mouth of the cave, Grayston and Furcolow accepted this epidemic as histoplasmosis (8, 9).

An epidemic of proved histoplasmosis occurred in persons entering a cave in Venezuela (12, 13). Conversion to histoplasmin sensitivity and significant complement fixation titers were demonstrated, and *Histoplasma* was isolated from 4 of 5 soil samples taken. The cave sheltered a large colony of bats.

Cases of histoplasmosis occurred in 46 persons entering caves sheltering bats in the Transvaal in South Africa (14). Animals placed in one cave were also infected, and *Histoplasma* was isolated from the tissues of these animals. Speleologists from the Cape of Good Hope who have not entered caves in the Transvaal have remained histoplasmin-negative.

A cave in Peru has been described as the source of histoplasmosis, formerly known locally as "fiebre de Tingo Maria" (15). This cave is inhabited by a nocturnal fruit-eating bird (*Steatornis caripensis*), sometimes called the "oil bird" because of the oil obtained from its fat, which is highly prized by residents of the area. Many susceptible persons entering the cave to collect these birds have developed a pneumonitis which is now recognized as histoplasmosis. *Histoplasma* was isolated from soil in the cave, and its presence there was attributed to enrichment of the soil by droppings of *S. caripensis*. However, it is known that bats also inhabit the cave. Grayston and Furcolow, in reviewing epidemics of histoplasmosis (8), mention a personal communication from Dr. E. Englert, Jr., who observed pneumonitis in persons who scraped quantities of bat dung from the timbers of a bridge in Maryland.

Methodology

The methods used in the present study for isolating *Histoplasma* from soil were those described in 1954 (3), and were only slight modifications of the methods used in the original isolation of *Histoplasma* from soil in 1949 (2).

Soil specimens were scooped up directly into sterile 25 by 50 mm. pyrex test tubes and the cotton stoppers were replaced to permit drying of the specimens. If the specimen is sealed, as by a screwcap top, the humidity of even a moderately dry soil encourages germination of fungus spores, germination of weed seeds, and activity of microfauna with a resultant rapid change in the microflora.

Immediately upon return to the laboratory, 10 to 15 ml. of the specimen was removed to another 25 by 150 mm. tube, 0.8 percent sodium chloride solution was added nearly filling the tube, a sterile rubber stopper was inserted, and the suspension was shaken vigorously for a half minute. The suspension was allowed to sediment for 10 to 15 minutes and 5 to 10 ml. of the supernatant was removed by pipette to a conical glass or small beaker. For each ml. of the supernatant, 0.25 ml. of an antibiotic solution (2 mg. streptomycin and 5 mg. penicillin per ml. water) was added and 1 ml. of this inoculum was injected intraperitoneally into each of 5 or 10 Swiss, white, general-purpose mice. The mice were killed after 4 weeks and cultures were made from liver and spleen. In the specimens with a high fecal content, it was sometimes necessary to increase the amount of antibiotic or to treat the inoculated mouse with antibiotics the next day. The remainder of the original soil suspension was held at room temperature for reexamination if necessary.

The House and Its Environs

The repeated isolation of *Histoplasma* from soil adjacent to the foundation of a bat-infested house near Clarksburg, Md., where several cases of histoplasmosis occurred, points to a relationship between this disease and the presence of the house bat.

My attention was brought to the Clarksburg episode when Dr. Donald Pohl, of the Children's Hospital in Washington, D. C., referred an infant with severe histoplasmosis to the Clinical Center of the National Institutes of Health in Bethesda, Md. The child had acquired a fatal infection shortly after its family had moved into the old house. Several of its siblings were also ill.

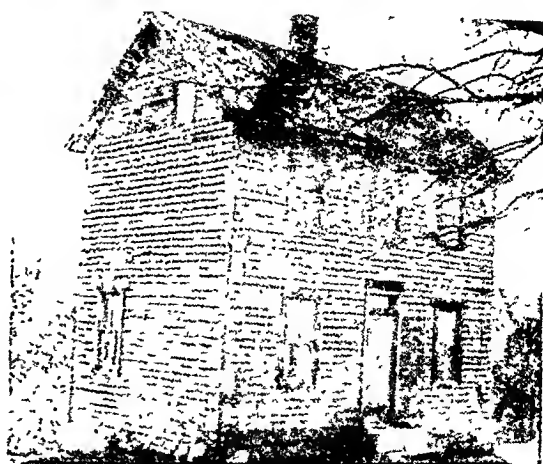
I first visited the premises with Dr. Pohl on

October 10, 1956. The only large building on the premises, where presumably the children were infected, was an old, 2-story frame residence (see illustration). The only other structures were a small shed 40 feet east of the house, which had been used many years before for chickens but was now a doghouse and storage shed, and a privy 150 feet southwest of the house.

The front dooryard consisted of bare, firm, clay soil, with a patchy lawn of bluegrass and other grass beginning about 15 feet from the house. The lawn east of the house sloped to the south and consisted of grass and weeds intersected by a bare soil pathway, deepened by erosion, extending nearly parallel to the east wall and 3-15 feet distant from it. The back dooryard to the south, except for small patches of grass and weeds, was bare for several feet adjacent to the house. Beyond an apple tree, which supported a child's swing, was a scattered accumulation of refuse where trash had been burned and ashes had been dumped. West of the house was a weedy grass lawn, sloping to the south.

The house was in poor repair, with loose siding and cornices containing apertures sufficiently large for the entrance of bats. One conspicuous irregular hole in the siding halfway up the east wall of the house was approximately 4 by 10 inches in size and showed evidence of frequent use. Bat dung was apparent on the ground adjacent to the solid stone and cement plastered foundation on all four sides of the house. It was especially abundant on the west side of the house where large quantities had fallen from the roosting sites of the bats in the attic and wall, and had accumulated between the exterior siding and the inner wall of the house. From this voluminous deposit, it had sifted out between the loose siding boards to the ground.

The family was aware that the house sheltered a colony of bats, and inspection of the attic revealed a large colony of the common brown bat or house bat, *Eptesicus fuscus*, and several bushels of bat guano. Sixteen bats were captured and brought to the laboratory where they were killed, measured, identified by the writer, and spleen, liver, and lung were cultured for fungi. In order to utilize more fully the



Histoplasma was isolated from soil adjacent to the stone and cement plastered basement wall on all four sides of this house. The hole in the east wall of the house and holes in the cornices were used by bats to gain entrance to the attic.

material, the brains were removed, pooled, and injected into mice in a test for rabies. No pathogenic fungus was isolated, and no Negri bodies were found by A. C. Faber who examined the mouse brains.

Isolations From Soil

When the premises were first visited in October, 28 soil samples were collected. Ten of these were adjacent to the doghouse and 18 were taken adjacent to the foundation of the house, the outside entrance to the basement, and inside the basement. As these latter samples were collected, we observed many bat droppings which had sifted out from accumulations under the loose siding or had fallen to the ground as bats entered the attic. Three of the ten samples taken adjacent to the doghouse were positive. *Histoplasma capsulatum* was isolated from 1 of 5 samples taken inside the cellar and from 11 of 13 samples taken adjacent to the foundation. It is noteworthy that positive samples were obtained from all four sides of the house.

On a second visit to the home on March 11, 1957, two samples were collected from soil adjacent to the foundation on the north side of the house. Both were positive.

On June 26, 1957, 24 hours after a 1-inch rain, 21 collections were made. The soil was

moist but well drained. Ten specimens were taken at approximately 1-foot intervals in a northerly direction from the north side of the house, across the front dooryard which was composed largely of bare, hard-packed earth, extending to the bluegrass sod lawn beneath an oak tree 25 feet from the house. *Histoplasma* was isolated from only one specimen collected adjacent to the foundation.

Cryptococcus neoformans was isolated adjacent to the foundation and from specimens taken 3 and 5 feet from the foundation. When this series of specimens was collected, expectorated sputum was observed on the moist soil at several points. The patches of sputum were avoided in collecting soil samples, but it was assumed that many other sputums, no longer visible, had been spit upon the yard adjacent to the front porch and elsewhere on this side of the house. The time interval since recovery from histoplasmosis of all surviving members of the household would preclude relating these sputums to pulmonary histoplasmosis, but they might relate to the isolation of *Cryptococcus* from these sites, where *Histoplasma* was not found.

Three specimens were taken adjacent to the foundation and at 1-foot intervals eastward from the northeast corner of the house; all were positive for *Histoplasma*. All five specimens taken at the foundation and at 1-foot intervals eastward from the southeast corner were positive. Of the three specimens taken near the foundation on the west side of the house *Histoplasma* was isolated from two, and all mice receiving the third specimen died within 24 hours.

Collections were made again on July 11, 1957, at a time when the soil was quite dry. Specimens were taken adjacent to the foundation and at approximately 1-foot intervals along three parallel lines running eastward. Among 10 specimens collected along the first line, only one adjacent to the foundation and one 1 foot from it were positive. Of 10 specimens along the second line, 4 from the sites marked at 0, 1, 2, and 3 feet and a fifth 6 feet from the foundation, were positive. Along the third line, 5 of 6 specimens taken adjacent to the foundation and out to a distance of 5 feet were positive.

Collections were made on August 22, 1957,

when the soil was dry, and specimens were taken adjacent to the foundation and at approximately 15-inch intervals running eastward from the house foundation, most of these specimens being from underneath bluegrass sod. Of 10 specimens, only the 4 adjacent to the foundation and extending out to 3½ feet were positive.

Eighteen soil samples were collected on September 30, 1957, again adjacent to the northeast corner of the house and running eastward at intervals of 1 to 3 feet. The first 5 specimens, extending to 3 feet from the foundation, were positive for *Histoplasma*. *C. neoformans* was isolated from the sixth specimen, which was in a footpath 5 feet from the house. *Histoplasma* was isolated from one specimen 9 feet from the house.

It seems apparent from the sampling already done that *Histoplasma* can be isolated consistently from soil adjacent to the foundation of this house and that its ability to grow here is related to the presence of bat droppings. It is further remarkable that there is no apparent association with chickens or other birds. The precise interval since chickens had been kept on the premises was not known by the residents except that it had been many years before. It is further remarkable that, although most of the studies of the spatial relationship were made on the north and east sides of the house, *Histoplasma* was isolated on all four sides, including the south side which was somewhat shaded by an elevated porch and a tree and the west side which had no protection from the sun.

Since the study was begun, we have been comparing selected soil samples taken near the foundation and positive for *Histoplasma* with samples taken at a distance of several feet and from which *Histoplasma* was not isolated. The soil is acid (pH 5.3-6.7) without consistent or significant differences in pH reactions between positive and negative soils. Unweathered bat dung has a pH reaction of 6.2 to 7.1. To date, although several hundred fungi have been isolated, we have not recognized significant differences in the microflora of positive and negative specimens. Sampling will be continued throughout 1958 in an investigation of the extent to which distribution of *Histoplasma* is limited on these premises and in a further search for seasonal differences, for histoplasmosis in

bats, and especially for micro-organisms which may either stimulate or inhibit *Histoplasma* in the highly competitive environment of soil.

Conclusion

The special significance of this study relates to a possible explanation of the prevalence of histoplasmin sensitivity and the occurrence of clinical cases of histoplasmosis in certain urban areas where the sources of infection are not yet recognized. It is a well-known habit of the brown bat (*E. fuscus*), sometimes called the "house bat," to live in crevices and attics of old houses, and "it is often seen about street lights in large cities where it finds congenial habitation in dark nooks in the roofs or in accessible crannies in the buildings" (16). Solitary individuals or pairs may roost throughout the active season behind the shutters of residences and seek shelter for hibernation in more protected spaces in the same or neighboring buildings or in caves in the winter. Fairly large colonies may inhabit the false fronts of shops or store buildings of an architectural style popular 50 years ago. The house bat is urban as well as rural in its choice of residence.

In view of the findings reported here, *Histoplasma* should be sought in soil samples adjacent to any buildings infested or colonized by bats in towns where histoplasmin sensitivity is observed under circumstances not readily explained by known exposures to the litter of chicken houses or other commonly recognized sources. It should be sought in towns where there is a differential histoplasmin-reactor rate, especially if the higher incidence of reactors is in an older part of town. Large old houses, even if in good repair, offer more crevices and shelters for bats than the small compact houses of new real estate developments.

This remarkable association of bats with a severe family epidemic of histoplasmosis and with the presence of *Histoplasma* adjacent to the foundation of the house may not be unique. Enrichment by bat feces of soil near a building infested by the house bat appears to be as effective in supporting the saprophytic growth of *Histoplasma* as bat guano is generally supposed to be in those caves associated with cases

of histoplasmosis. The wide distribution of the house bat and its intimate association with man and human dwellings may well support a widespread reservoir of *Histoplasma* in soil to which man is frequently exposed.

Summary

Histoplasma capsulatum was isolated from 50 of 105 soil samples from 6 collections made between October 1956 and September 1957 on the premises where a family epidemic of histoplasmosis had occurred. Chickens, often associated with the saprophytic growth of this fungus, had not been kept on the premises for many years.

Histoplasma was isolated from 45 of 66 soil specimens (68 percent) taken adjacent to or within 5 feet of the foundation wall of the house and from only 2 of 29 (6.8 percent) taken 6-18 feet from the house. Three of ten samples taken near a doghouse were also positive.

The house sheltered a colony of the brown, or house, bat (*Eptesicus fuscus*), and bat dung was found adjacent to the foundation. The presence of bats is the apparent factor responsible for the constant saprophytic infestation of soil on these premises with *H. capsulatum*.

The house bat inhabits suitable shelters in towns and cities, as well as rural areas, and may be the ecologic factor responsible for the presence of *Histoplasma*, prevalent histoplasmin sensitivity, and clinical histoplasmosis in observed instances of urban histoplasmosis in towns and cities where reasons for the occurrence of these phenomena have not yet been determined.

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Cerebrovascular Diseases Classified

All known types of brain "strokes" have been classified and defined for the first time in a 2-year study conducted by a committee appointed by the National Institute of Neurological Diseases and Blindness, Public Health Service. The committee, comprising eight of the Nation's leading physicians, was formed to explore ways of facilitating research in cerebrovascular diseases.

In addition to setting up a common language for the exchange of information of researchers, the classification serves as a useful tool in the treatment of "strokes." Precise diagnosis is imperative in new treatments for several types of brain blood vessel diseases, the study points out.

Nine major categories are set up in the classification, with changes in tissue the determining factor in the groupings. Two categories include the majority of cases: blocks in a blood vessel and rupture or hemorrhage of a blood vessel. Next important is temporary lack of blood without tissue death.

In emphasizing the pioneering character of the study, Dr. Clark H. Millikan, neurologist of the Mayo Clinic, Rochester, Minn., and committee chairman, said that many statements in the study may undergo modification as understanding of the diseases increases.

Copies of the study, *A Classification and Outline of Cerebrovascular Diseases*, which appeared in the May 1958 issue of *Neurology*, may be obtained from the National Institute of Neurological Diseases and Blindness, Public Health Service, Bethesda 14, Md.

Decreasing Radiation In Photofluorography

EDWARD L. ERNSBERGER

DURING the last several years, considerable attention has been given to reducing the amount of diagnostic X-radiation that medical and dental patients receive. With this objective, research has concentrated on the radiographic process, making improvements in intensifying screens and film emulsions, to reduce exposure of both film and patient without loss of detail of the diagnostic picture.

A major consideration is that up to 98 percent of the density of a radiograph, except for the nonscreen type of film, may result from the actinic rays given off a fluorescent screen under the influence of X-ray energy. The remaining density is a consequence of X-rays directly. In photofluorographic work, the radiograph is obtained by a purely photographic process. A camera records on photographic film the image appearing on a chemically treated surface that fluoresces under the influence of X-radiation.

The period of film exposure required to obtain an image by this photographic procedure determines the necessary period of X-ray production. Therefore, shortening the necessary photographic exposure time, by use of a "brighter" fluorescent screen or a more sensitive film emulsion to record the image, permits corresponding reductions in X-ray exposure time for the patient and in the amount of scattered radiation the technician and others in the vicinity of the X-ray machine will absorb.

Faster Film Emulsions

Within the last few months, a new green-sensitive photofluorographic film (A), type PFG-470, which has a faster emulsion than film produced previously (A), type PF-470,

has been put on the market. This new film was tested in the Electronics and Technical Service Laboratory, Tuberculosis Program, Public Health Service, to compare its emulsion speed with that of the earlier type.

Both types of film were exposed on a 70-mm. photofluorographic X-ray machine, using a safety-timer instead of a phototimer. An impulse counter (one impulse being equal to $\frac{1}{150}$ second) was connected across the field coil of the main contactor to measure the time of each exposure. A Presdwood phantom, representing the patient, was used in front of the hood. The grid in front of the fluorescent screen was removed so that grid lines would not interfere in making density readings. The X-ray machine was operated at 100 kilovolts peak and 175 milliamperes. All factors, except time, were kept constant, and exposures were made on both types of film.

The two strips of film were processed simultaneously by the temperature-time technique in open tanks containing regular X-ray processing solutions. After the film was washed and dried, the density in the same area of each frame of film was measured by a densitometer. The base plus fog level density was measured in the clear area between each two frames and subtracted from the density reading in the frame to obtain the density of the emulsion. The emulsion density readings and the film density readings were then plotted against time periods in impulses, and smooth curves were drawn through the points for both types of film (fig. 1). By choosing a density reading and noting the corresponding exposure time on each curve, the comparative speeds of the two films were obtained.

It is noteworthy that the new film emulsion is twice as fast at the density of 1 as the older type. The older type has a colorless base in contrast to the light purple base of the new. This, of course, affects the overall apparent density and makes the new type of film 2.8 times faster than the old at the density of 1.

Less Radiation

Another study carried out in this laboratory determined the effect of added filtration on:

Mr. Ernsberger is an electronic scientist with the Electronics and Technical Service Laboratory, Public Health Service, Rockville, Md.

1. Skin dose received by a patient from a 70-mm. chest photofluorogram.

2. Exposure time.

The work was done in a bus unit containing a 70-mm. photofluorographic machine. All exposures were phototimed, and an impulse counter was connected across the field coil of the main contactor to measure the time in multiples of $\frac{1}{120}$ of a second. Again a Presdwood phantom was used. A condenser R meter with a 25-roentgen chamber was used to measure the radiation at the surface of the phantom, which represents the skin dose received by the patient. Pieces of half-hard-rolled aluminum sheet, 0.025 inches thick, were used for the added filtration.

X-rays were produced at 100 kilovolts peak and 175 milliamperes, first with no added filtration, then with added filtration, in steps of 0.025 inch. The observed data are graphed in figure 2. An increase in the period of exposure is required with increased filtration to obtain a given density; radiation experienced by the phantom in the direct beam decreases, neverthe-

Figure 1. Comparison of speed of two types of photofluorographic film (100 kilovolts peak, 175 milliamperes).

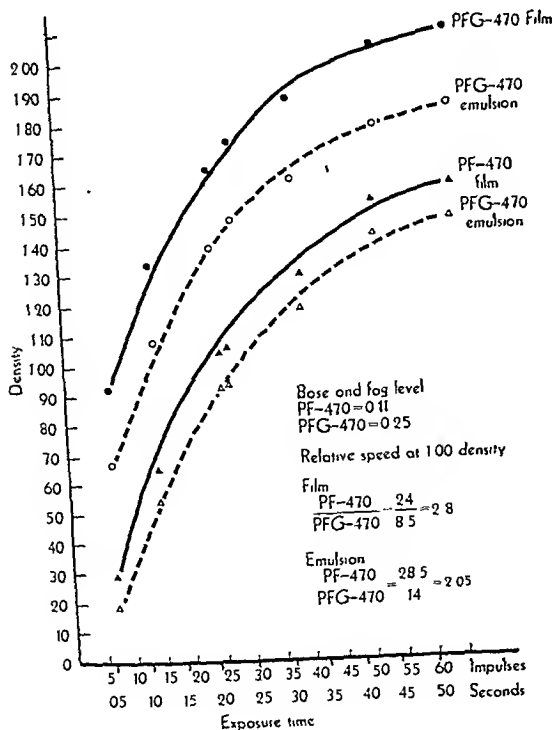
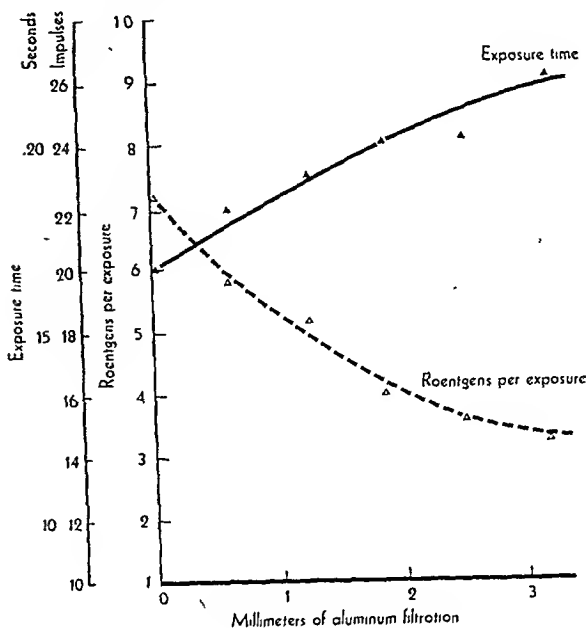


Figure 2. Effect of aluminum filtration on exposure time and radiation dose.



less. With 3 mm. of added aluminum filtration, the phantom received only 55 percent of the dose received without such filtration even though the length of exposure increased 30 percent. The aluminum filters out those X-rays of longer wave length which are absorbed by the patient and do not contribute to the brightness of the fluorescent screen.

Summary

A new type of photofluorographic film (PFG-470) requires an exposure period only half as long as the earlier type (PF-470) to obtain a radiograph of the same density. Thus, the patient receives only one-half the radiation. If 3 mm. of aluminum filtration is added, the patient will receive approximately half the radiation dose he would receive without it, with either type of film, even though the exposure time must be increased a third to obtain an image of a given density.

To illustrate these reductions, for a fluorogram of a patient of average size made with the earlier type of film and no added filtration (100 kilovolts peak and 175 milliamperes), the exposure time may be 18 impulses, or 0.15 seconds. If 3 mm. of aluminum filtration is added

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Serologic Studies of Staphylococcal Enterotoxin

E. P. CASMAN, Ph.D.

THE NEED for a simple and specific technique for demonstrating and assaying staphylococcal enterotoxin has been recognized for a long time. Research efforts ranging from biological tests with small and relatively cheap animals (1, 2) to extensive chemical and serologic studies of enterotoxin (3) have not attained this important objective.

The many contradictory reports found in the literature (4) on staphylococcal enterotoxin are evidence of the inadequacy of the crude, difficult, and impractical tests that are available for its detection. Evidence incriminating suspected foods in outbreaks of staphylococcal food poisoning is largely circumstantial and is limited to the use of epidemiological findings and the demonstration of the presence in the suspected food of appreciable numbers of enterotoxin-producing staphylococci. The very ubiquity of the staphylococcus and, conversely, the possibility of the presence of the heat-resistant enterotoxin in foods which no longer contain viable staphylococci, detract considerably from the value of such procedures.

Furthermore, the demonstration of enterotoxigenicity of the isolated staphylococcus involves considerable effort. The isolated organism must be cultured on special media in order to produce the enterotoxin, and the presence of the latter is determined by the feeding of monkeys or the parenteral introduction of the culture filtrates into monkeys or cats. When available, human volunteers may be fed

the suspected food or the culture filtrate. Monkeys, cats, and humans vary considerably in their susceptibility to the enterotoxin and may acquire an increased tolerance to it. Prior to parenteral administration of the culture filtrate it is necessary to remove or neutralize the alpha or beta hemolysins which may be present. These toxins are lethal and may in themselves elicit the emetic reaction characteristic of the enterotoxin. The monkey-feeding test, although specific, is impractical because of its low sensitivity, the marked variation in susceptibility of the animals, and obvious problems of their cost, availability, handling, and maintenance.

Parenteral administration of the enterotoxin to cats is complicated by the activity of the alpha and beta hemolysins, by rapid production of increased tolerance to the enterotoxin, and by a considerable variation in susceptibility of test animals. This method is, however, more sensitive, cheaper, and more convenient than the monkey-feeding test. In the studies presented here, 3 to 10 ml. of culture filtrate was injected intravenously into unanesthetized adult cats, as described by Hammon (5). Prior to injection, alpha and beta hemolysins were removed by boiling, neutralization with antiserum containing antibodies for alpha and beta hemolysins, or by digestion with pancreatin (unpublished data). The cats were used once only.

Key strains of staphylococci, selected for the production of enterotoxin for immunization purposes, were checked for enterotoxigenicity by feeding culture filtrates to monkeys.

The studies described here were designed to

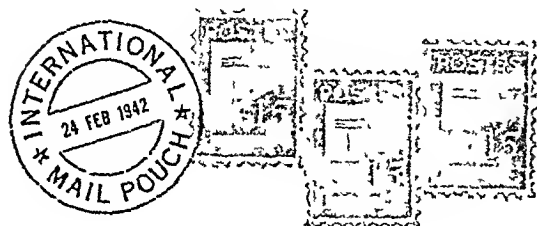
Dr. Casman is a bacteriologist in the Division of Microbiology, Food and Drug Administration.

with this type of film, the patient will receive only half as large a dose of radiation although the exposure time will be increased to 24 impulses, or 0.20 seconds. If the new film is used, which simultaneously halves both the exposure time and the dose, an exposure of 12 impulses, or 0.10 seconds, will suffice, and the

radiation dose will be only one-fourth of that received with the older type of film without the added filtration.

MATERIALS

(A) Type PFG-470 and type PF-470 film, Eastman Kodak Co., Rochester, N. Y.



Health Survey in Nepal

Our bureau of local health services has finished its first health survey, reporting on 157 persons in Hitura, Nepal, in territory described as "Paradise" in a recent travel movie. In the last 5 years, deaths occurred in 20 of the 30 families surveyed; 7 of the deaths came before 1 year of age and 13 before the age of 20.

The 34 women questioned in the survey had had 9 abortions or stillbirths and 142 deliveries of live babies; but 18 of these infants died before the age of 1 year. These figures mean an annual mortality rate of more than 4,000 per 100,000 or 4 per 100 population. This rate cannot be projected because of the small sample, but Hitura's mortality rate may possibly represent all of rural Nepal.

—RAYMOND E. STANNARD, M.D., public health adviser, U. S. Operations Mission, Nepal.

First Conference

Thailand's first national conference of public health workers was held at Choburi in March 1957. From all parts of the country, 200 health officers, nurses, sanitary engineers, health educators, and other workers gathered to confer, review, and plan for the nationwide public health program.

—ANDREW P. HAYNAL, deputy chief, public health adviser, U. S. Operations Mission, Thailand.

Cochabamba's Boycott

The 100,000 people of Cochabamba were vaccinated in 7 days when smallpox broke out in this Bolivian city. Health service workers found 218 cases, but it is assumed that many others were hidden and that some infected persons left to escape isolation.

In a mass campaign 24 teams of medical students vaccinated house by house, 5 teams of nurses vaccinated at schools and factories, and 16 vaccination clinics were set up at government and private agencies and in industrial plants. Cochabamba's 29 pharmacies were given instructions and equipment for inoculations.

Local authorities and the public joined in a voluntary boycott which was decisive in the campaign's success. Banks, restaurants, buses, cinemas, and public offices refused to serve unvaccinated persons.

Glycerinated smallpox vaccine previously used in Bolivia proved to be of doubtful potency; several persons vaccinated a month before developed the disease during the outbreak. Lyophilized vaccine was imported from France and Peru for the mass vaccinations.

At the close of the campaign, 105,548 people—including both the resident and floating population—had been vaccinated. These were identified by indelible ink marks on the finger tip, which helped to establish the number inoculated.

As the campaign extends to rural areas of Cochabamba Department and later to the rest of the nation, it is expected that smallpox will be wiped out in Bolivia.

—HARALD S. FREDERIKSEN, M.D., chief, health, housing, and welfare field party, U. S. Operations Mission, Bolivia.

the same medium which had been incubated for 20 to 24 hours with rocking or rotation.

Separation and Concentration

It was necessary to concentrate and partially purify the crude toxin before use in attempts to immunize rabbits and in the serologic studies described below. This was accomplished briefly as follows: After removal of the organisms by centrifugation and filtration through a Selas candle, the filtrate was reduced in volume approximately 100 times by dialysis and concentration. Dialysis was carried out for 2 or 3 days at 5° C. against distilled water containing 1:1,000,000 merthiolate. Concentration was then accomplished by preevaporation in a current of air or by the use of a flash evaporator.

Some of the larger volumes of culture filtrate were partially purified and concentrated by first adjusting the pH to 3.2–3.3 at 0° C. with 1:5 HCl to precipitate a considerable amount of nonenterotoxic material and then precipitating most of the enterotoxin from the supernatant by slowly adding methanol to a final concentration of 25 percent while maintaining the temperature at –5° C. or lower.

In some of the immunization studies in which toxins prepared with enterotoxic staphylococcus strains No. 224 and No. 230 were used, digestion with crystalline trypsin was found to remove the hemolysins without appreciable destruction of the enterotoxin. After such treatment, however, it was necessary to increase the concentrations of methanol to 40 to 65 percent in order to precipitate the enterotoxin.

The crude concentrates obtained by these procedures varied considerably in potency, containing from 200 to 1,000 cat-vomiting doses per milliliter. A cat-vomiting dose is the minimal amount of enterotoxin which consistently produces emesis in cats. This is determined by injecting intravenously twofold serial dilutions into healthy cats.

The availability, later, of enterotoxins of higher potencies permitted a considerable acceleration in the progress of the present study. These were concentrates of toxins of strains 196E and S6 obtained through the courtesy of Dr. G. M. Dack. The toxins had been pro-

duced in a protolysate medium (10) and the dry S6 preparation had been considerably purified, using procedures described by Bergdoll (3). The crude 196E concentrates contained appreciable amounts of alpha and beta hemolysins and varied in potency, having a dry weight of from 10 to 90 µg. per cat-vomiting dose. The partially purified S6 preparation contained a small amount of alpha hemolysin and no beta hemolysin and consistently produced emesis in cats with as little as 2 µg. dry weight.

Demonstration of Antigenicity

In the exploratory stages of this phase of the study, immunization of rabbits was carried out over a long period of time, using as antigen trypsin-digested concentrates of No. 224 enterotoxin prepared in a variety of ways and injected at variable dosages both intravenously and subcutaneously. Rabbits were found to possess a marked though variable susceptibility to enterotoxin. When the intravenous route of injection was employed, some rabbits were killed in 12 to 24 hours by 1 or 2 cat-vomiting doses. It was necessary, therefore, to build up resistance to the enterotoxin gradually. One or two cat-vomiting doses in 1 or 2 percent alum were repeatedly injected intracutaneously or subcutaneously, or both, until a tolerance to the intravenous injection of approximately two vomiting doses of the enterotoxin was established. The amount of antigen was then increased and injected subcutaneously. The intervals between injections were adjusted according to the animal's maintenance of weight. In later stages of the immunization, in which larger amounts of antigen were used, the alum content was increased to 10 percent and the antigen was administered subcutaneously in divided doses. All alum-containing antigens were adjusted to a final pH of 6.0 and were preserved with 1:10,000 merthiolate.

Antigens prepared with 196E concentrates or with the partially purified S6 enterotoxin were not subjected to tryptic digestion. Both potassium alum and Freund's adjuvants (emulsion of 2 parts of antigen dissolved or suspended in saline, 1 part Falba, and 1 part paraffin oil, with 0.02 percent killed human

determine the possible value of serologic procedures for the development of a practical test for staphylococcal enterotoxin and were carried out in the following sequence: (a) production of enterotoxin in a simply prepared and dialyzable fluid medium; (b) separation and concentration of the enterotoxin for purposes of immunization and serologic testing; (c) demonstration of antigenicity by the passive transfer of immunity and by *in vitro* neutralization of enterotoxin, using serum from immunized rabbits; and (d) demonstration of an antigen common to enterotoxin-containing culture filtrates and absent in culture filtrates known not to contain enterotoxin.

Production of Enterotoxin

Since staphylococcal enterotoxin is produced in relatively small amounts, it was felt essential that a culture medium be used from which the products of bacterial growth could be easily separated. To this end, a medium was sought which was dialyzable, free from lipids, proteins, and carbohydrates, and capable of supporting good staphylococcal growth and toxin production.

Alpha hemolysin rather than enterotoxin productivity was studied in the early development of the medium, and later the adequacy of the medium for the production of enterotoxin was determined by comparison with preparations made in Dolman and Wilson's soft agar medium (6). Aeration by rocking (7) or rotation (8) of shallow fluid cultures in an atmosphere of 40 percent carbon dioxide and 60 percent oxygen was employed in this portion of the study.

Favorite and Hammon (8) suggested the use of a simple medium for the production of enterotoxin, consisting of a hydrolysate of casein enriched with glucose, nicotinic acid, and thiamine. To obtain good growth and toxin production, they found it necessary to inoculate the medium rather heavily with a culture prepared in a meat infusion peptone broth, thus supplying additional growth factors but at the same time introducing complex organic substances. In our hands this medium and procedure failed to give consistently good yields of either alpha hemolysin or enterotoxin.

When a commercially prepared acid hydrolysate of casein (Difco's Casamino acids) was employed, it was found that in order to obtain very good growth of staphylococci it was necessary to add calcium pantothenate, l-cystine, tryptophane, and magnesium sulfate in addition to glucose, nicotinic acid, and thiamine. To obtain good production of alpha hemolysin, it was found necessary to substitute sodium acetate for the glucose and to add an optimal amount of iron. The following formula, which was found to be best for growth and the production of alpha hemolysin, consistently supported the production of enterotoxin.

| | Gram |
|--|-----------|
| Ferric citrate..... | 0.025 |
| K ₂ HPO ₄ | 1.0 |
| KH ₂ PO ₄ | 1.0 |
| MgSO ₄ · 7H ₂ O..... | 0.2 |
| l-cystine..... | 0.025 |
| Sodium acetate..... | 7.0 |
| l-tryptophane..... | 0.075 |
| Casamino acids (Difco)..... | 20.0 |
| | Microgram |
| Calcium pantothenate..... | 500 |
| Thiamine hydrochloride..... | 40 |
| Nicotinic acid..... | 1,200 |
| | Liter |
| Distilled water..... | 1 |

The pH was adjusted to 7.2-7.4 by the addition of approximately 1.0 ml. of 10 N sodium hydroxide, and the medium was sterilized by autoclaving at 121° C. for 15 minutes after distribution in the final container. Inoculum were small (0.1 ml. of an 18- to 24-hour broth culture) for 30- to 100-ml. quantities of medium and no special atmosphere was required. The method of aeration varied with the volume of toxin desired. The rotation at 20 rpm of 30-ml. quantities of the culture in 8-oz. nursing bottles (8), the rocking (7) of 100-ml. quantities in Roux bottles through an arc of 20° each 1½ seconds, and the sparging of air through larger volumes (9) all proved satisfactory. While enterotoxin was produced in all three procedures after 24 hours, rotated or rocked cultures were harvested after 30 to 48 hours of incubation at 35°-37° C. Larger volumes of culture were aerated by sparging with filtered air for 20 to 24 hours after inoculating with approximately one-tenth volume of a culture in

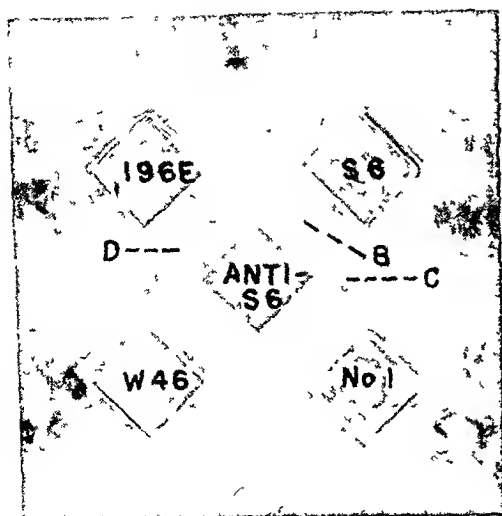


Figure 1. Zones of precipitation after absorption of anti-S6 serum with Wood 46 and No. 1 concentrates and an extract of No. 243 organisms. Illustrating the formation of a "line of identity" (the coalescence of lines D and B) and a "line of nonidentity" (the intersection of lines D and C). Evident also is the antigen excess effect obtained with the concentrated culture filtrate of strain No. 1 which, in addition to failing to produce a zone of precipitation, prevents the complete development of line B.

ence of a distinguishing antigen common to enterotoxigenic strains might permit the development of a test for the detection and assay of this toxin. A slight modification of the Petri-dish agar diffusion method of Ouchterlony (14, 15) for the qualitative analysis of soluble antigens and antibodies was used for this purpose.

In Ouchterlony's method, antiserum is added to a centrally located well in the agar and antigens are added to peripheral wells. Antigens and antibodies diffuse toward each other through the agar to form zones or lines of precipitation where the two combine in optimal proportions. The method permits separation of multiple precipitation systems into their individual components and, in addition, permits the comparison of two antigens or antibodies with each other in order to establish their identity, partial identity, or nonidentity (fig. 1).

In our study, plates were prepared with a base containing 1.6 percent Noble Special Agar (Difco), 0.8 percent NaCl, 0.01 percent merthi-

olate, 0.003 percent methyl orange, and M/25 veronal. The mixture was melted, adjusted to pH 7.4 and filtered through paper until clear. A central well and four peripheral wells were prepared using rectangular aluminum blocks, measuring 8 mm. square in cross section. A central hole, measuring 2 mm. in diameter was bored through the length of each block to facilitate its removal from the solidified agar. The wells were prepared by covering the bottom of a standard Petri dish with 10 ml. of the agar. After solidification, the blocks were placed in position and an additional 20 ml. of the agar was added and allowed to solidify. The blocks were carefully removed from the agar and arranged as recommended by Wilson and Pringle (16), with a distance of 7 mm. between the central serum-containing well and the peripheral antigen-containing wells. The plates were allowed to remain uncovered for 30 to 60 minutes at 35° C. prior to use. The wells were charged with 0.2 ml. quantities of the reagents and were not refilled. Results were recorded after 5 to 8 days at room temperature.

The S6 antiserum was found to contain antibodies for antigens possessed by both enterotoxigenic strains and nonenterotoxigenic strains of staphylococcus. It appeared necessary, therefore, to remove most of the antibodies for these common antigens before attempting to demonstrate the presence of an antigen peculiar to enterotoxigenic preparations and absent from those that were enterotoxin free.

To attain this goal, anti-S6 serum was first absorbed with concentrated filtrates of enterotoxin-negative strains Wood 46 and No. 1. Both strains gave negative tests for enterotoxin when injected into cats in amounts equivalent to 50-60 ml. of crude culture filtrate. The Wood 46 strain was obtained from the Connaught Laboratories, Toronto, Canada, in 1938. It is coagulase-positive, produces an appreciable amount of alpha hemolysin, and has also been found to be nonenterotoxigenic by other investigators. Strain No. 1 was isolated in 1949 from the stomach contents of an infant who succumbed to what appeared to be staphylococcal food poisoning. This strain differed from nonenterotoxigenic strains and resembled enterotoxin-producing strains in that it contained heat-stable antigen which was precipitated by anti-

tubercle bacilli and preserved with 1:10,000 merthiolate) were used in the preparation of 196E antisera (11). For the preparation of anti-S6 sera, only Freund's adjuvants were employed.

Sera were obtained from the rabbits under immunization from time to time and tested for their antienterotoxin content either by preliminary mixture with approximately 2 vomiting doses of homologous enterotoxin (neutralization) 1 or 2 hours before injecting cats or by their ability to produce in cats a passive immunity (protection) to approximately 2 vomiting doses of enterotoxin. In the latter procedure the intravenous injection of the serum was followed within 3 to 5 minutes by injection of the challenging dose of enterotoxin. The amount of serum required to demonstrate neutralization or protection varied with the rabbit source, the duration of the immunization procedure, and the potency and adjuvant composition of the enterotoxin antigen.

With the more potent enterotoxins 196E and S6 it was possible to demonstrate the production of "protective" antienterotoxin in a relatively short period of time after tolerance to the enterotoxin had been produced by the repeated intracutaneous, subcutaneous, and intravenous injection of 1 or 2 vomiting doses. For example, a rabbit prepared in this fashion could be injected subcutaneously with 1,000, 2,000, and 3,000 vomiting doses of 196E in 10 percent alum at 14-day intervals. Protection against 2 vomiting doses of the homologous enterotoxin was demonstrated with 0.3 ml. of serum obtained 10 days after the final injection of the antigen. Another similarly prepared rabbit was immunized with 25, 125, 250, and 375 vomiting doses of S6 antigen containing Freund's adjuvants. Protection against two vomiting doses of the homologous enterotoxin required the use of 0.8 ml. of serum obtained 30 days after the final injection of antigen. As little as 0.08 ml. of an anti-196E serum was found to confer a passive immunity against its homologous enterotoxin. In most instances, however, 0.3 to 0.5 ml. of serum was required to produce this effect.

The results of more than 65 tests, representing repeatedly confirmed observations, are summarized in the table. Results obtained with

serum fractions prepared according to the procedures of Nichol and Deutsch (12) and Aladjem and Lieberman (13) are included. Quantitative determinations of the antienterotoxin content of the antisera were not made. In no instance, however, was more than 0.5 ml. of the serum fraction, or its equivalent of whole serum, used. The antigenicity of the enterotoxins from the three staphylococcus strains, Nos. 224, 196E, and S6, is clearly demonstrated. All react with their homologous enterotoxins, and 196E antiserum protects against heterologous S6 and 230 enterotoxins. Pseudoglobulin as well as the globulin fractions of Nichol and Deutsch prepared from 196E antisera neutralized 196E enterotoxin and protected cats challenged with 196E and 230 enterotoxins.

Demonstration of a Common Antigen

With the production of sera containing antibodies for homologous and for heterologous enterotoxins, an attempt was made to reveal a serologic relationship between enterotoxin from different strains of staphylococcus. It was felt that the establishment of the serologic identity of staphylococcal enterotoxin or the pres-

Neutralization of enterotoxins by rabbit antisera and passive transfer of immunity as determined by the intravenous test on cats

| Antiserum | | Challenging enterotoxin | Results | |
|--------------------|------------------------------------|-------------------------|----------------|------------|
| Immunizing antigen | Modification of serum | | Neutralization | Protection |
| 224 | None | 224 | + | ----- |
| 224 | do | 230 | - | ----- |
| 196E | do | 196E | + | + |
| 196E | Pseudoglobulin ¹ | 196E | + | + |
| 196E | None | 230 | ----- | + |
| 196E | B, C-1, C-2 fractions ² | 230 | ----- | + |
| 196E | Pseudoglobulin ¹ | 230 | ----- | + |
| 196E | None | S6 | ----- | + |
| S6 | do | S6 | ----- | + |

¹ Pseudoglobulin prepared according to procedure of Aladjem and Lieberman (13).

² Fractions prepared according to procedure of Nichol and Deutsch (12).

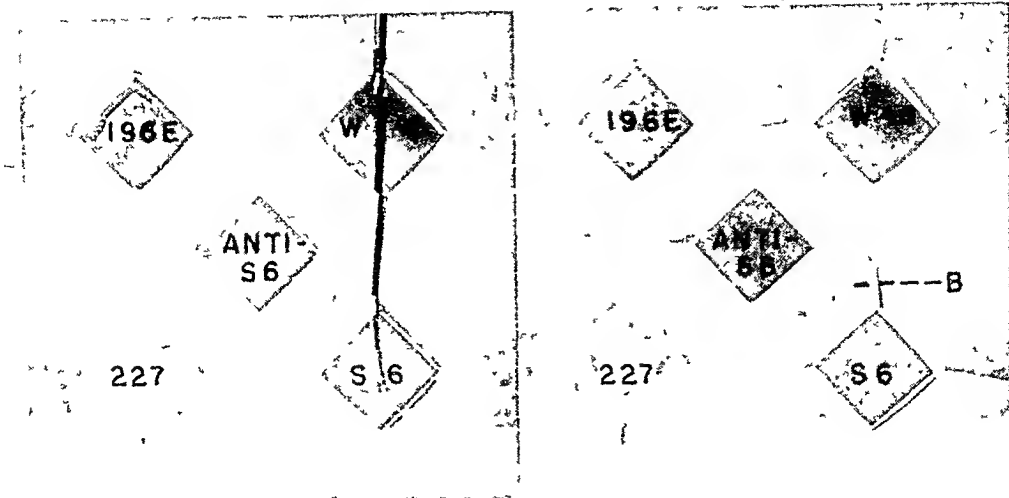


Figure 3. Effect of further absorption with either a concentrated culture filtrate of strain No. 243 (left) or an extract of No. 243 cells (right). Both absorbing antigens remove the heavy line of interference seen in figure 2. Absorption with the cell extract, however, removes less of the antibody which produces the single line with 196E and the more peripheral (line B, right) of the two lines produced with S6 antigen. The nonenterotoxic Wood 46 and No. 227 antigens produce no lines.

figures 2 and 3. The interference line of S6 was removed and only one good line of precipitation was formed with the heterologous 196E toxin. The outer of the two remaining lines formed with the homologous S6 toxin (line B, figs. 1 and 3) could be identified with the single sharply defined line formed with 196E toxin by placing these antigens in adjacent wells to produce clear-cut lines of precipitation which coalesced at the junction of the respective precipitation lines (fig. 1).

The absorbed S6 serum was used finally, to test 100-fold concentrations of culture filtrates of 21 strains of staphylococcus which had been found to be enterotoxigenic by the cat test and 6 enterotoxin-negative strains for their ability to produce "lines of identity" with 196E and S6 toxins. Of the 21 enterotoxigenic strains, 16 were isolated from foods epidemiologically incriminated in food poisoning incidents. Two were isolated during routine examination of foods not involved in food poisonings. Two were isolated from feces from patients with enteritis following intensive antibiotic therapy, and one (No. 244) from the nose of a child.

Typical results obtained with some of the culture filtrates are shown in figure 4. All but one of the enterotoxigenic strains gave lines of

identity with both toxins. The one exception, No. 244, was not a food poisoning strain but was isolated from the nose of a child. This strain gave a positive cat test for enterotoxin shortly after isolation, but, when retested, was found to have lost this ability. Of the 6 enterotoxin-negative strains, 5 produced no lines of any kind. The sixth, however, produced a well-defined line of identity with the two positive controls. This strain, No. 260, had been isolated during routine bacteriological examination at the New York City Department of Health Laboratories from crab meat which was not involved in a food poisoning incident.

The antigenic component common to the 21 enterotoxigenic strains is shared by strains No. 260 and No. 1, both of which are apparently nonenterotoxigenic. Strain No. 1 produces this antigen in relatively large amounts. This was shown by an antigen-excess effect when its concentrated culture filtrate was used in the Ouchterlony plate test. It failed to form its portion of the line of identity and also inhibited the development of the portion produced by the enterotoxic control (line B in fig. 1). Furthermore, the antibody in the absorbed serum responsible for the production of the lines of identity was present in small amount and could

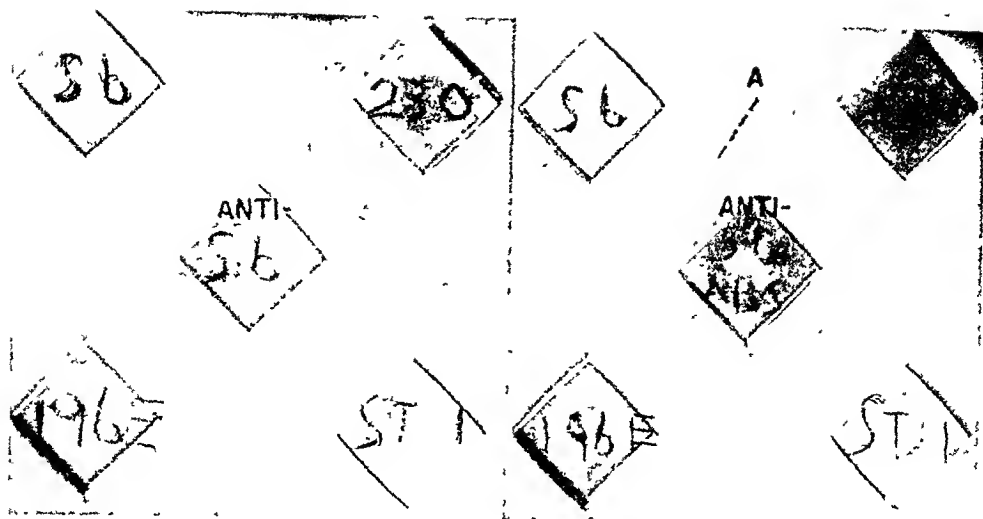


Figure 2. Effect of absorption of anti-S6 serum with concentrates of culture filtrates of strains Wood 46 and No. 1. Many of the precipitation systems produced with unabsorbed serum (left) are not obtained with the absorbed serum (right). Detection of coalescence of lines produced by heterologous 196E and No. 230 enterotoxins with one produced by the S6 antigen-antibody system is interfered with by heavy line A.

enterotoxin serum absorbed with a concentrated culture filtrate of the Wood 46 strain.

The effectiveness of the absorption procedures was determined by preparing Ouchterlony plates to demonstrate coalescing lines of precipitation (lines of identity) between S6 and 196E (see fig. 1) enterotoxins and the absence of such lines in the antigens used for absorption. For this purpose, the peripheral wells were charged with 100-fold concentrates of culture filtrates of the Wood 46 and No. 1 staphylococcus strains and with 2 to 4 cat-vomiting doses of S6 and 196E enterotoxins. Undiluted absorbed serum was placed in the central well.

Although absorption with the Wood 46 and No. 1 antigens removed much of the antibody in the serum (fig. 2), demonstration of a "line of identity" belonging only to the S6 and 196E toxins was not possible. This was due (a) to the possession by the No. 1 strain of staphylococcus of an antigen which was common to the enterotoxigenic strains although not found in the other nonenterotoxigenic strains under study, and (b) to the presence in the anti-S6 serum of an antibody which was not sufficiently absorbed by the Wood 46 and No. 1 concentrates so that a heavy masking zone of precipitation was produced in the Ouchterlony plate with S6 enterotoxin (fig. 2, right).

Culture filtrates of enterotoxigenic strain No. 243 differed from others under study in that, like the S6 enterotoxin, they produced a heavy masking zone of precipitation with the absorbed anti-S6 serum. Further absorption of the serum with a glass bead extract (17) of the cells of strain No. 243 removed the masking antibody. The cell extract rather than a concentrated culture filtrate was employed because of the presence of a smaller amount of enterotoxin in the cell extract. Assay for enterotoxin by injecting cats and for "interfering antigen" by titration with the Wood 46 strain No. 1-absorbed anti-S6 serum showed that the concentrated culture filtrate contained 7 times more interfering antigen but 30 times more enterotoxin than did the cell extract. Absorption of the absorbed serum with the extract of the No. 243 cells resulted in the production of a good, well-defined line of identity between the undiluted absorbed serum and S6 and 196E enterotoxins. Use of the more toxic concentrate of the culture filtrate of strain 243 instead of the cell extract for this purpose resulted in the production of a markedly less well-developed line of identity (fig. 3).

The effects of absorption with the enterotoxin-negative Wood 46 and No. 1 strains and with the No. 243 preparations are presented in

line with the heterologous 196E enterotoxin in the agar diffusion plate test (fig. 5).

The presence, in strains No. 1 and No. 260, of the antigen otherwise common only to enterotoxigenic strains, suggested the possibility that the use of other culture media and procedures might reveal their enterotoxigenicity. Cultivation of these strains in a mixture of 40 percent carbon dioxide and 60 percent oxygen instead of air and on Dolman's soft agar has yielded negative results. Attempts to demonstrate in the products of growth of these strains a protoxin similar to those described for some of the clostridial toxins (18-20) have yielded essentially negative results. In addition, attempts passively to protect cats against S6 enterotoxin with antiserum prepared against concentrated culture filtrates of strain No. 1 have also been unsuccessful, further indicating that the "common antigen" is neither toxin nor protoxin.

Discussion

The work of Dolman and Wilson (21) contributed substantially to the direction of the studies presented here. Using antiserum produced in a horse, they were able to demonstrate a specific flocculation reaction which appeared to involve the enterotoxin and its homologous antibody. They indicated the desirability of support of their findings with many flocculation tests performed "in conjunction with parallel kitten tests, and involving filtrates derived from a large number of strains."

The absence of such confirmative studies, in the light of present knowledge, would seem to be attributable to the difficulties involved in the production of a specific antiserum of sufficient potency and the necessary dependence on one or more of the inadequate tests for the enterotoxin. The presence of not more than 5 percent enterotoxin in the purest preparations so far prepared by Bergdoll (22) and the consistently positive emetic responses obtained in the present work with 2 μ g. of the partially purified S6 enterotoxin suggest a possible explanation for earlier failures to confer passive immunity (5, 23), since in these studies antisera were produced by immunization with relatively weak and crude preparations. In

addition, inability to obtain an active immunity to heterologous enterotoxins in monkeys (24) and in cats (25) may have discouraged such studies.

Conflicting reports as to the antigenicity of staphylococcal enterotoxin (5, 6, 23, 26, 27) indicated the need for studies designed to resolve this important phase of the problem. Although repeated demonstrations of the production of an acquired immunity or "increased tolerance" to enterotoxin had been made, the evidence for passive transfer of immunity was lacking.

Neutralization of enterotoxic preparations, however, had been reported. Dolman, Wilson, and Cockcroft (28) found that the serum from a kitten made resistant to enterotoxin neutralized the enterotoxin when a mixture of the two was injected into a normal kitten. Davison, Dack, and Cary (29) confirmed this report when the mixtures were injected intraperitoneally. When the intracardial route of injection was used in kittens, or the intravenous route in monkeys, there was no neutralization by the serum, they reported. They also stated: "When normal kitten blood was added to a mixture of enterotoxic filtrate and antiserum and then injected intraperitoneally into normal kittens, protection was not assured." These investigators concluded that the presence of whole blood, extravascularly or intravascularly, prevented the neutralization of enterotoxin by its antiserum. Dolman (27), however, demonstrated neutralization of enterotoxin by serum from immunized human and animal sources by injecting enterotoxin-serum mixtures intravenously into cats. Hammon (5), working with crude toxins, failed to demonstrate *in vivo* neutralization through the use of "hyperimmune" sera from cats and rabbits. Surgalla, Bergdoll, and Dack (30) were able to demonstrate a neutralization of S6 enterotoxin after mixing the toxin with the homologous rabbit antiserum and feeding the mixture to monkeys. More recently, Burbianka (31), administering enterotoxin and antiserum to cats by the intravenous route, claimed to have neutralized a minimal enterotoxic dose of enterotoxin with as little as 0.005 ml. of an antiserum produced in rabbits. Antiserum, produced against enterotoxin derived from one strain of staphylococcus neu-

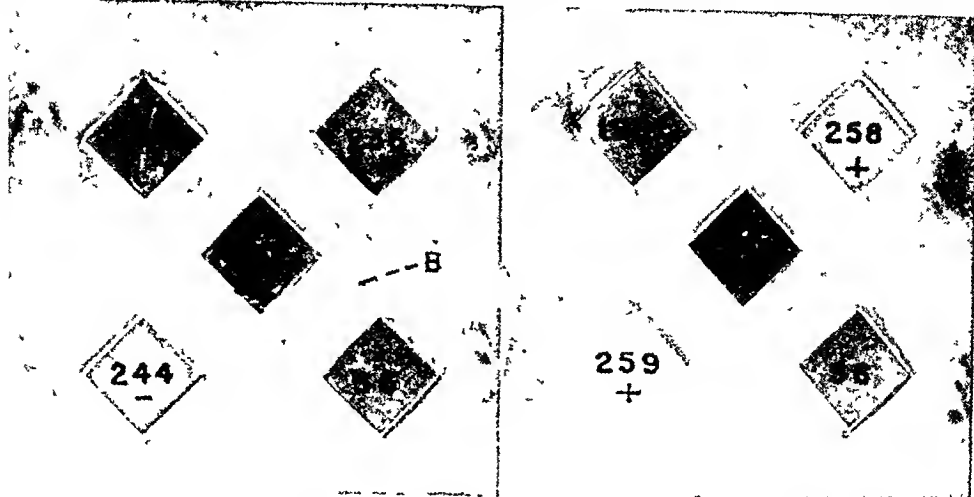


Figure 4. Examples of coalescing zones of precipitation ("lines of identity") formed between enterotoxigenic (designated with a plus sign) culture filtrates and the two control enterotoxins (S6 and 196E). Left: The line of precipitation produced with enterotoxigenic culture filtrate of strain No. 236 coalesces with the single 196E line and with the outer (line B) of the two lines produced by the S6 enterotoxin. The nonenterotoxigenic No. 244 produces no lines.

be removed completely by further absorption with the strain No. 1 concentrate. It was apparent, therefore, that it would be desirable to eliminate the use of this antigen for absorption of the anti-S6 serum.

Use of diluted anti-S6 serum after absorption with Wood 46 cells alone was subsequently found to be a better procedure for the procurement of an absorbed serum with which to demonstrate the antigenic component common to the 21 enterotoxigenic and 2 nonenterotoxigenic preparations. Wood 46 organisms removed from air-sparged culture by filtering and centrifuging were suspended in saline to give a heavy suspension, cooled to 4° C., and poured into 15 volumes of acetone at about -20° C. After standing overnight at -15° to -20° C., the acetone was removed and the cells were washed three times by suspending in acetone at -15° C. and centrifuging at -10° C. The organisms were then dried under vacuum and over CaCl₂ and stored at 5° C. Absorption of anti-S6 serum with acetone-dried Wood 46 cells was carried out by adding 10 percent (W/V) of the dried organisms to the serum, shaking until a uniform suspension was obtained, incubating at 37° C. with occasional shaking during a period of 2 to 3 hours, and placing at 5° C. overnight. The cells were removed by centrifuging

at 20-25° C. and washed with enough saline to adjust the absorbed serum to its original volume. The serum was absorbed a second time in the same manner and examined in order to determine the dilution giving a sharp

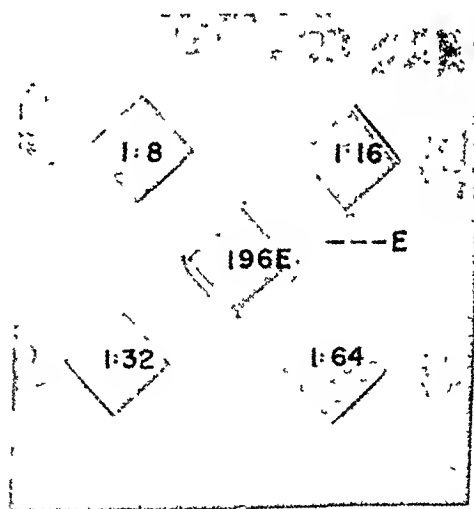


Figure 5. Effect of diluting anti-S6 serum (in peripheral wells) after absorption with Wood 46 cells, on the definition of the single line produced with the heterologous 196E enterotoxin (in central well). Use of a 16-fold dilution of the absorbed serum results in the production of the most sharply defined line (line E).

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John K. Hoskins, 1884-1958

John K. Hoskins, who entered the Public Health Service in 1913 and became the Service's first chief sanitary engineer in 1943, died on May 16, 1958, in Chevy Chase, Md.

Mr. Hoskins served as Assistant Surgeon General of the Public Health Service from 1944 to 1947, when he retired from the Service.

As chief of an outstanding group of engineer-scientists, Mr. Hoskins directed stream pollution studies on the Ohio River in the early decades of the century. The reports published by this group, classics in the field, include the original formulation of the basic law of the biochemical oxygen demand reaction and the "oxygen sag" curve, and procedures for ascertaining the bacterial quality of water.

In this 2-year followup of a survey performed in an epidemic area of North American blastomycosis it was found that blastomycin skin sensitivity may be retained for at least 2 years in the absence of histoplasmin sensitivity or evidence of clinical blastomycosis.

Followup of Blastomycin Sensitivity in an Epidemic Area

J. GRAHAM SMITH, JR., M.D., WALTER C. HUMBERT, M.D., and SIDNEY OLANSKY, M.D.

TO GAIN more information about sensitivity to the blastomycin skin test and its relation to reactivity to the complement fixation test, a second survey in the area of Grifton in Pitt County, N. C., was conducted on May 21, 1956. Covering a sample of the persons found positive to the blastomycin skin test or the blastomycosis complement fixation test in the first survey in April 1954, it provides data on conversions and reversions.

The survey in April 1954 was instituted because of an epidemic of North American blastomycosis affecting 11 patients during the winter of 1953-54 in Grifton (1). It included 70-mm. chest X-rays, tuberculin, histoplasmin, and blastomycin skin tests, and blastomycosis

complement fixation tests. No cases of blastomycosis or histoplasmosis were discovered, although one case of active pulmonary tuberculosis was found.

Of the 1,648 persons surveyed in 1954, 2.9 percent were blastomycin sensitive and 6.4 percent were histoplasmin sensitive. There was no correlation of the blastomycosis complement fixation test with blastomycin skin sensitivity. Of the patients with positive blastomycin skin reactions, 4.7 percent had positive blastomycosis complement fixation tests, as opposed to 2.8 percent positive reactors in the total population tested, but 30.2 percent of the individuals with positive histoplasmin skin tests also had positive blastomycosis complement fixation tests, as opposed to only 6.4 percent in the total population.

These findings strongly suggested cross-reactions between the histoplasmin skin test and the blastomycosis complement fixation test. Unfortunately, histoplasmosis complement fixation tests were not done; it was therefore not possible to test the hypothesis that the correlation between the two might be explained by cross-reactions between the histoplasmosis and the blastomycosis complement fixation tests. On the basis of evidence from the 1954 survey it was believed that the sensitivity to both histoplasmin and blastomycin antigens in some

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This paper was presented in part before the American Academy of Dermatology and Syphilology, Chicago, December 10, 1956. It is a follow-up of an earlier study, an account of which appeared in the February 1957 issue of Public Health Reports, pp. 95-100.

individuals might be explained partly by a common mode of infection rather than a cross-reaction (2).

Since the 1954 survey, 5 more cases of blastomycosis have been diagnosed in the same county, and 4 of these patients lived within a 4-mile radius of Grifton at the time of onset of disease. (None of the 5 patients, however, had been included in the 1954 survey.) Of the 4 cases occurring in the Grifton area, 3 had onset of pulmonary disease during the fall and winter of 1954-55, and the fourth patient noted a nodular lesion on the left leg in mid-January 1956. The diagnosis of blastomycosis was established by smear and culture in all of these patients, and all were treated satisfactorily with 2-hydroxystilbamidine.

The occurrence of these cases, as well as the desire to learn more about blastomycin and histoplasmin skin test sensitivity, prompted the second survey.

Method of Study

Because of limitations of time and personnel, as well as the subsidence of the community interest and hysteria engendered by the 1953-54 epidemic, it was decided that a maximum of information could be obtained by skin testing again all individuals who had had positive blastomycin skin tests or positive blastomycosis complement fixation tests in the 1954 survey. In the 1954 survey, 42 individuals given a blastomycin skin test had induration of 5 mm. or more at 48 hours, and 43 individuals, a complement fixation titer of 1:1 or more to *Blastomyces*. Since 2 individuals had both a positive skin test and complement fixation test, the total was 83. Letters were sent to this group requesting that they return for reexamination.

Of the 83 positive reactors in 1954, 43 reported for reexamination. These 43 constituted an excellent and presumably random sample of the 1954 group. Twenty-three of the 42 with positive blastomycin skin tests (54.7 percent) and 22 of the 43 with positive blastomycosis complement fixation tests, including the 2 individuals with both positive skin tests and positive complement fixation tests, composed the 1956 group. The 43 individuals

ranged in age from 3 to 65 years, and 23 of them were under age 20.

One-tenth milliliter of each of the two antigens was injected intradermally. Blastomycin antigen was placed in the right forearm, and histoplasmin in the left forearm, both injections at approximately the same level. New syringes and needles were used for each antigen. In no instance was a syringe or needle re-used during this survey.

The histoplasmin (lot H-42) was diluted 1:100. The blastomycin was a *Blastomyces* vaccine prepared from 6-day yeast phase cultures grown on brain-heart infusion blood agar slants at 37° C. The yeast cells were suspended in saline and heat-killed at 56° C. for 2 hours; the vaccine was diluted 1:1,000 by volume in a Hopkins tube before use. The vaccine dilution, although not strictly an extract, is referred to as blastomycin in this paper. Both of these antigens were supplied by Dr. Norman F. Conant, of Duke University.

At the time the skin tests were read, the individuals surveyed were interrogated about the state of their health. All skin tests were read 48 hours after injection of the antigens by measuring the diameter of areas of erythema and induration with a millimeter ruler. The tests were considered positive when induration was 5 mm. or more and doubtful when erythema was 10 mm. or more.

All 43 participants contributed blood for blastomycosis and histoplasmosis complement fixation tests. These tests were performed at the Communicable Disease Center of the Public Health Service in Chamblee, Ga., through the cooperation of Dr. Kenneth W. Walls.

The *Histoplasma* antigen used for the complement fixation tests was histoplasmin prepared from single strains of mycelial *Histoplasma capsulatum* grown on C. E. Smith's culture medium for the preparation of coccidioidin, incubated at 25° C. for 6 months (3). The cultures were killed with merthiolate, Seitz filtered, and then pooled.

The blastomycosis antigen used for the complement fixation test was prepared from one isolate of *Blastomyces dermatitidis* grown in brain-heart infusion agar at 37° C. for 5 days. The cells from this yeast-phase growth were washed from the agar, killed with merthiolate,

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at the time of the first survey and was non-reactive to both tests in the second survey, 1 developed histoplasmin reactivity, and 1 lost reactivity to both antigens as mentioned above. Of the 6 individuals with reactivity to both antigens, 2 were still reactive 2 years later.

Twenty of the 22 (91 percent) serums previously reactive to the blastomycosis complement fixation test were nonreactive in 1956. Seven conversions to a positive reaction to the histoplasmin skin test and two conversions to the blastomycosis complement fixation test were observed, but none to the blastomycin skin test. Three strengths of histoplasmin were used in 1954, and 5 of the 7 histoplasmin converters were in the group tested with the weakest histoplasmin (H-42, 1:1,000).

Table 3 shows the correlations of the two skin tests with each other and with the blastomycosis complement fixation test. All the possible combinations of positive and negative reactions to these three tests occurred.

Discussion

There were no cross reactions between the histoplasmosis and blastomycosis complement fixation tests; however, only 4 individuals had reactive blastomycosis complement fixation tests in the second survey. In the absence of clinical blastomycosis, a positive blastomycin skin test was maintained for as long as 2 years. Reversion to negative occurred in a considerable number of individuals, 8 of 23, or 34.8 percent. Reactivity to the blastomycosis complement fixation test was maintained 2 years in 2 individuals, and conversions of the blastomycosis complement fixation from nonreactive to reactive were observed.

The conversions of the histoplasmin skin test from negative to positive were not unexpected in this endemic area (4). The reversion from positive to negative in 1 individual may be explained by cross-reaction to the blastomycin skin test; in the other 2, by loss of sensitivity. These reversions are not unique, such a change having been reported in the past (5, 6). Reversion occurs also with the coccidioidin test in coccidioidomycosis (3) and the tuberculin test in tuberculosis (7).

A positive intradermal reaction to blastomy-

cin with a negative reaction to histoplasmin can occur, and although cross-reactions undoubtedly exist, the possibility that positive reactions to both antigens indicate dual infection, apparent or subclinical, must be considered. This is suggested because over a period of 2 years, of the 6 persons with dual reactivity, 1 lost histoplasmin reactivity retaining blastomycin sensitivity, 2 lost blastomycin reactivity retaining histoplasmin sensitivity, 2 maintained reactivity to both antigens, and 1 lost sensitivity to both. Individuals who have positive intradermal reactions to both antigens and maintain this reactivity over long periods of time may represent examples of subclinical dual infection, whereas those who lose reactivity to one antigen only may represent cross-reactions. Cross-reactivity could also be invoked to explain these changes in sensitivity; however, the occurrence of dual infections in man (8) and dogs (9) would suggest that this may not always be the case. Changes in the size of the reaction to the two antigens with time also may prove to be useful in differentiating the cross-reaction from inapparent or apparent infection.

Correlation of the results of all the tests in each individual shows that all the possible combinations of positive and negative blastomycin skin tests with reactive and nonreactive complement fixation tests may occur in persons who do not have clinical blastomycosis but who live in a blastomycosis epidemic area.

Summary

To examine further the reactivity of healthy individuals in a blastomycosis epidemic area to the blastomycin and histoplasmin skin tests, a second survey was conducted in the area of Grifton in Pitt County, N. C., in May 1956. It included 43 of the 83 persons who had had positive blastomycin skin tests or positive blastomycosis complement fixation tests in a survey in April 1954.

In the 2-year period, 34.8 percent of the previously positive blastomycin skin test reactors had reverted to negative, and 91 percent with previously positive complement fixation to blastomycosis were now negative. No conversions to positive blastomycin skin tests were found in the selected group included in this

centrifuged and washed. A 20 percent suspension of cells was ground with sand (50 percent weight/volume) and centrifuged, to remove the particulate matter. The supernatant fluid was used for the antigen. This was the same type antigen used in the complement fixation tests performed in the earlier study (2). The complement fixations were titrated by the usual "box" titration.

Results

None of the 43 persons surveyed in 1956 gave a history of pulmonary disease, and none of the histoplasmosis complement fixation tests were reactive. The reactivity of the group to the blastomycin and histoplasmin skin tests and to the blastomycosis complement fixation test is shown in table 1. The changes in reaction

Table 1. Reactions to blastomycin and histoplasmin skin tests and to blastomycosis complement fixation test, Grifton, N. C., 1954 and 1956

| Reaction | 1954 | 1956 |
|-------------------------|------|------|
| Blastomycin skin test: | | |
| Positive..... | 23 | 15 |
| Negative..... | 20 | 28 |
| Histoplasmin skin test: | | |
| Positive..... | 9 | 15 |
| Negative..... | 29 | 28 |
| Not done..... | 5 | 0 |
| Blastomycosis CF test: | | |
| Positive..... | 22 | 4 |
| Negative..... | 17 | 39 |
| Not done..... | 4 | 0 |

Table 2. Changes in blastomycin and histoplasmin skin tests and blastomycosis complement fixation test over 2-year period (1954-56), Grifton, N. C.

| Items | Skin test | | CF test |
|-----------------------------------|-------------|--------------|---------|
| | Blastomycin | Histoplasmin | |
| Maintenance of reactivity..... | 15 | 6 | 2 |
| Conversion to positive test..... | 0 | 7 | 2 |
| Reversion to negative test..... | 8 | 3 | 20 |
| No reactivity..... | 20 | 22 | 15 |
| Total tested in both surveys..... | 43 | 38 | 39 |

Table 3. Correlation of blastomycin and histoplasmin skin tests with each other and each with blastomycosis complement fixation test in the same individual, Grifton, N. C., 1954 and 1956

| Test correlations | 1954 | 1956 |
|---|------|------|
| Blastomycin and histoplasmin: | | |
| Both positive..... | 6 | 4 |
| Blastomycin only positive..... | 14 | 11 |
| Histoplasmin only positive..... | 3 | 11 |
| Both negative..... | 15 | 17 |
| Blastomycin and blastomycosis CF test: | | |
| Both positive..... | 2 | 1 |
| Blastomycin only positive..... | 17 | 14 |
| Blastomycosis CF only positive..... | 20 | 3 |
| Both negative..... | 0 | 25 |
| Histoplasmin and blastomycosis CF test: | | |
| Both positive..... | 5 | 1 |
| Histoplasmin only positive..... | 3 | 14 |
| Blastomycosis CF only positive..... | 15 | 3 |
| Both negative..... | 11 | 25 |

¹ No individuals in this group because of selection of persons for 1956 survey.

NOTE: Only persons tested to both agents included.

from 1954 to 1956 are summarized in table 2.

Many of the persons with positive blastomycin (15 of 23, or 65.2 percent) and histoplasmin (6 of 10, or 60 percent) skin tests remained positive although reversions to negative occurred in both groups. Two of the three individuals whose histoplasmin skin tests reverted to negative had positive reactions to both histoplasmin and blastomycin in 1954. One of these two, a 3-year-old white girl, had an induration of 5 mm. to both antigens in 1954 and no induration to either in 1956. The other, a 9-year-old white boy, had 12-mm. induration with 40-mm. erythema to blastomycin and 15-mm. induration with 20-mm. erythema to histoplasmin in the first survey. Two years later the blastomycin reaction had 5-mm. induration with 11-mm. erythema, but the histoplasmin produced no erythema or induration. The third of the histoplasmin reverts was a 33-year-old woman. She had a negative blastomycin test in both surveys with 12-mm. induration to histoplasmin in 1954 and 4-mm. induration 2 years later.

Of the 8 persons whose blastomycin skin test reverted to negative, 2 maintained reactivity to histoplasmin, 3 showed no reactivity to histoplasmin, 1 was not tested with histoplasmin

The Institute of Agricultural Medicine of the State University of Iowa is unique in that it is devoted exclusively to the public health of rural areas. This interim report gives the first account of its research program.

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RICHARD A. TJALMA, D.V.M.

IN CONTRAST to urban dwellers, rural families have enjoyed relatively little of the protection afforded by public health agencies. For this reason, research at the Institute of Agricultural Medicine at the University of Iowa has undertaken exploratory studies of rural health, with identification of major needs as its first concern. With sympathetic collaboration by investigators in other centers, a general evaluation and demonstration of rural health programs will ensue.

Public health functions, historically, have been designed and organized to serve urban populations. Particularly is this true of the epidemiology of infectious disease, the foundation of public health work. The massing of large populations created an excellent breeding ground for epidemic and endemic infections. The wealth and governmental experience of the cities at the same time provided facilities for public health activity; otherwise, the cities would have perished.

Traditional public health methodology is not always applicable to rural conditions. Techniques of control and investigation, designed for urban settings, frequently are not well suited to the sparsely settled communities. The nature of local government structure in

Dr. Tjalma is assistant professor of the department of hygiene and preventive medicine of the College of Medicine, State University of Iowa.

some rural areas precludes the establishment of typical administrative public health programs. Disease and accident reporting, a prerequisite to efficient public health programming, is inadequate especially in areas that are not organized on a communitywide basis. Considerable study is needed to determine what the real health needs of rural populations are, how health services for rural segments of the population are being met, and wherein they can be improved.

Rural Health Hazards

The saying, "The farm is the safest and healthiest place in the world to live," is frequently heard in rural areas. Although it may be the "healthiest," available statistics show it to be something other than the "safest" place in which to live. The number of farmers killed on the job in 1955 exceeded that of any other single occupational group. Of a total of 14,200 occupational deaths, 3,700, or 26 percent, occurred among farmers, estimated at only 7 percent of the working population. On the basis of rates of fatal on-the-job accidents, farming is the third most dangerous occupation, only mining and construction outranking it (1a). The total number of farm injuries in 1956 was 1,050,000 (1b). Tractor accidents alone account for approximately 700 deaths among agricultural workers each year.

The variety and amount of chemicals in com-

survey, but two individuals previously negative to the blastomycosis complement fixation test were found to be positive.

Both skin sensitivity to blastomycin and blastomycosis complement-fixing antibodies tended to decrease in the 2-year period, but the complement-fixing antibodies disappeared in a higher percentage of the individuals tested.

Seven persons became reactive to the histoplasmin skin test and three lost their reactivity. The loss of reactivity in one instance might possibly represent cross-reactivity to the blastomycin skin test. None of the group surveyed had a positive histoplasmosis complement fixation test.

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Training in the Care of Prematures

The tenth year of the institutes for physicians and nurses in the care of premature infants will begin in the fall of 1958. The institutes are sponsored by the New York State Department of Health and the U. S. Children's Bureau.

The training is planned to meet the needs of physicians and nurses in charge of hospital premature nurseries and premature centers, and medical and nursing directors and consultants in State and local programs.

Attendance at each institute is limited to six physician-nurse terms. For physicians, the program lasts 2 weeks, and for nurses, 4 weeks. There is no tuition fee, and stipends are provided to help cover expenses during attendance. The institutes are scheduled to begin September 22, 1958; November 3, 1958; January 12, 1959; February 23, 1959; and April 20, 1959.

For additional information, write to Box 143, Institute in the Care of Premature Infants, New York Hospital, 525 East 68th Street, New York 21, N. Y.

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some rural areas precludes the establishment of typical administrative public health programs. Disease and accident reporting, a prerequisite to efficient public health programing, is inadequate especially in areas that are not organized on a communitywide basis. Considerable study is needed to determine what the real health needs of rural populations are, how health services for rural segments of the population are being met, and wherein they can be improved.

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mon use on the farm suggest another health hazard. Expanding agricultural application of insecticides, fumigants, herbicides, rodenticides, fungicides, and even fertilizers has resulted in no less than one-quarter million brand-name chemical products now being used. An estimated national total of 3,300 accidental deaths are caused each year by the misuse of chemicals (2). Commercial label warnings, including instructions concerning precautionary measures, are often impractical under field conditions.

By virtue of their occupation, their environment, or both, farmers and other rural dwellers are frequently exposed to animal diseases. Iowa, with a total human population of approximately 2.5 million, has a domestic animal population which includes 6.5 million cattle, 1.3 million sheep, 12 million swine, and 30 million fowl (3). In addition, it is estimated there are more than 1 million dogs and cats.

Establishment of the Institute

Iowa, with a substantial rural population, has a vital interest in the health of agricultural workers. The opportunity to explore this area on an organized basis was made available by a 3-year grant from the W. K. Kellogg Foundation in September 1955. The Institute of Agricultural Medicine, the first in the United States, was established as a part of the department of hygiene and preventive medicine of the College of Medicine, State University of Iowa. After expiration of the original grant, the institute will continue to function as an integral part of the College of Medicine. Present personnel consist of a medical director, an industrial hygienist, a social anthropologist, a toxicologist, a statistician, and a public health veterinarian. Future plans call for the addition of a health educator and a safety engineer.

As originally conceived, the function of the institute is the demonstration and evaluation of public health problems of a rural nature. Activities of a control or regulatory nature are not considered a part of the institute program. A close working relationship has been established with the following groups and agencies: Iowa State Medical Society; Iowa State Department of Health; the Iowa Farm Bureau Federation; the School of Veterinary Medi-

cine, the School of Agriculture, the School of Engineering, and the Extension Service of Iowa State College.

Survey for Baseline Data

Our initial problem was lack of basic rural public health data. Limited available information served only to suggest probable or potential rural health problems. Epidemiological information on infectious diseases, accidents, and other suspect problems was nonexistent. In an effort to establish baseline information, an extensive rural health survey has been designed. It is expected this study will result in the recognition of specific problem areas. Future activities can then be designed to investigate these areas in detail.

Classical toxicology studies of hazards in the agricultural use of chemical products based on short-term animal experimentation are time consuming and expensive and their results questionable when applied to humans. The institute has established facilities to investigate the possibility of utilizing tissue culture techniques as a method of toxicological evaluation.

Accident prevention studies may be organized on an anthropological basis. Why do different ethnic groups, living in geographic proximity, engaged in the same tasks, and using essentially the same equipment, have significantly different accident rates? Why are certain groups of individuals willing and eager to use safety devices, while other groups refuse to consider the use of such items? To what extent are advances in agricultural mechanization responsible for accidents? These and similar questions may be answered by socioanthropological investigation.

Recent studies in this area indicate certain groups consider safety devices "sissyfied" and therefore unacceptable. In many areas it is considered quite reasonable not only to dispense with personal safety gear but also to remove these safeguards built into farm machinery. This is particularly true for cornpickers and power takeoff systems. The institute in collaboration with a local Iowa company has developed a cornpicker safety tool. A controlled field trial of this new tool, including a group acceptance study, is now in progress.

A study designed to investigate the differences between various groups in accepting routine immunization procedures has been completed. Families in the lower socioeconomic brackets were found to neglect routine immunizations when left to their own devices. Specific suggestions by the family doctor had little or no influence. However, such families were quick to participate in any sort of community-sponsored immunization program.

Zoonotic Patterns

Animal diseases are of importance to the health of rural people. Of the 115 diseases in this category, approximately 40 are known to occur in Iowa. Although classic epidemic disease patterns are infrequently observed in rural populations, epizootics of animal diseases may be expected to occur in rural areas. Recognition of an epizootic pattern is frequently the most efficient method of identifying a potential or existing human health hazard.

Leptospirosis constitutes a rural health hazard of unknown proportions. Repeated surveys in various parts of the United States have shown that 3 to 12 percent of the cattle population is serologically positive for leptospirosis (4-8). The incidence of leptospirosis in swine is thought to be considerably higher (5, 9). Relatively little investigational work has been done on human leptospirosis in Iowa. Serologic diagnostic facilities are unavailable at either the medical college or the laboratories of the Iowa State Department of Health.

Only recently have such facilities been established at the School of Veterinary Medicine. To gather baseline data on the incidence of human leptospirosis the institute now is testing all serum samples submitted to the laboratories of the State health department. The vast majority of these samples are submitted by practicing physicians for brucellosis testing. On the basis of some 3,000 such tests, approximately 2 percent are *Leptospira* positive. A similar survey of 1,000 premarital blood samples has resulted in the detection of only one positive specimen. Future activity in this area will be the routine investigation of all serums positive to *Leptospira*.

Q fever has been demonstrated as existing

in enzootic form in Iowa dairy cattle (10). Although less than 1 percent of the cattle appear to be infected, it is estimated that 3.5 percent of the dairy herds contain one or more infected animals. *Cowdella burnetii* has been isolated from the milk of serologically positive cattle. Preliminary human serologic studies show 8.5 percent of 200 Iowa veterinary practitioners to be Q-fever positive.

In cooperation with the State and Federal departments of agriculture, and the Iowa State Department of Health, an attempt is being made to investigate the possible relationship between tuberculosis in farmers and the occurrence of tuberculin-positive cattle. Particular attention is given the matter of tuberculin-positive cattle which appear to be free of lesions at slaughter inspection. This project is supported by a grant from the Iowa Tuberculosis and Health Association.

Iowa's poultry industry is rapidly expanding. Several cases of suspect human psittacosis due to domestic fowl contact have been investigated. The possibility that psittacosis is occurring in domestic fowl in Iowa is currently under investigation. This study comprises the routine screening of fowl serums for evidence of infection. A field trial of the antibiotic and millet seed preparation, as perfected by Dr. K. F. Meyer for the control of psittacosis infection in cage birds, has been completed. The product proved completely effective.

Rabies constitutes another serious problem in Iowa. Efforts have been made to isolate rabies virus from both normal and abnormal Iowa bats. All such efforts have proved unsuccessful to date. The fact that most barns house a bat colony serves to stimulate interest in this problem.

A project protocol has been written and an enabling grant received for the epidemiological investigation of toxoplasmosis. The results of preliminary studies indicate a high correlation between human toxoplasmin sensitivity and a history of routine animal contact. Of particular interest is the role of *Toxoplasma* in cases of degenerative retinitis in farmers.

Future research plans of the institute include a study of rural mental health. Iowa's suicide rate is 30 percent above the national average. Consideration is being given the matter of de-

layed or chronic sequelae of infectious diseases such as brucellosis. An attempt will be made to explore the effects and methods of rural health education.

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Perrott Retires

George St. J. Perrott, chief of the Division of Public Health Methods of the Public Health Service since 1939, retired June 30, 1958.

Director of the National Health Survey during 1935-36, he also directed the development of the National Health Survey established in 1957. Mr. Perrott has been associated with the direction of *Public Health Reports* since 1943 and was a major influence in the decision to convert the weekly edition to an expanded monthly journal in its present form. He has been managing director of *Public Health Reports* since 1952.

Mr. Perrott first joined the Public Health Service in 1933 as principal statistician. Previously, he served with the Bureau of Mines, where, from 1927-31, he directed the activities at the Pittsburgh Experiment Station, a research center for studies on health and safety in industry.

From 1917 to 1927, he was a chemist with the Chemical Warfare Service in Pittsburgh;

during a Washington assignment with the Warfare Service in 1918-19, he carried the rank of first lieutenant.

Recognized as a national authority in health statistics, Mr. Perrott received his education at the University of North Dakota and Princeton University. He is a member of the American Statistical Association.

Dr. William H. Stewart, special assistant to the Surgeon General for program operations since 1957, succeeds Mr. Perrott as chief of the Division of Public Health Methods.

Dr. Stewart was commissioned in the Public Health Service in 1951, serving as chief of the Epidemiological Unit of the Communicable Disease Center at Thomasville, Ga., during 1952 and 1953. After assignments with the Heart Disease Control Program in the National Heart Institute in 1953 and 1954, he was named assistant chief and then chief of that program in the Bureau of State Services. In 1956 Dr. Stewart became assistant director of the National Heart Institute.

With prevention of mental illness a goal and psychiatric time limited, this health department assigns supportive roles to nurses and consultative roles to psychiatrists. Cooperation with schools, official and voluntary agencies, and State mental hospitals aids in progress toward the goal.

A Health Department's Activities in Mental Health

H. L. BLUM, M.D., M.P.H., and W. A. KETTERER, M.D., M.P.H.

NEITHER a psychiatrist nor a psychiatric clinic was available in Contra Costa County, Calif., 10 years ago to handle the problems of emotional illness encountered by the Contra Costa County Health Department. During these years, we have sought to increase the staff's understanding of emotional illness, to promote better interpersonal relationships among members of the health department and other related groups, and to find the optimum use of psychiatrists and nurses in consultative and supportive roles. In addition, we have engaged in many community activities, such as family life education, to promote better mental health.

Contra Costa County, located east of San Francisco Bay, grew 300 percent between 1940 and 1950 to a total population of 299,000. By 1957, with growth continuing at a much slower rate, the population had reached 375,000. The health department was modest in size until 1950 when it began to expand, with services shaped to the community's needs. A decentralized working staff of sanitarians and nurses serve and represent the health department in specific geographic areas. In the county pat-

tern schools provide their own nurses, while the health department provides medical, dental, nursing, health education, sanitation, and other consultative services to any school desiring them.

Although the health department provides extensive clinic services, increasing industrialization and the spread of medical care insurance have somewhat decreased the problems of providing medical care. And, with health department emphasis on preventive rather than therapeutic medicine and encouragement of "whole care" in public and private practice, the actual ratio of population to clinic use has declined significantly in the past few years.

Initial Planning in Mental Health

In 1948, it became apparent that some of our persistently vexing problems in public health centered upon emotional illness. Three other county agencies felt similarly about many of their problems, and an informal meeting was arranged for representatives of the Contra Costa County welfare, school, probation, and health departments to consider creating a psychiatric or child guidance clinic. With our very limited means, it soon became clear that a clinic seeing so few patients would rapidly become saturated and its use to us would be minimal.

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Thus, a concept developed that mental health activities in the county would have to be more than a series of therapeutic situations between the psychiatrist and individual patients. We felt that a consultant psychiatrist could assist certain groups of professionally trained workers with mental health problems. The training of professional workers would result in the availability of many mental health services throughout the community on a scale quite impossible if the same limited psychiatric time were available only in a clinic situation. Therefore, arrangements were made for each agency to receive psychiatric consultation for one-half day a month. It was agreed to keep this experimental approach open to modification.

Development of the original scheme resulted in the inclusion of more county agencies in the psychiatric consultation program and the formation of the Mental Health Coordinating Committee of county agencies. Today, this committee comprises the department heads of nine different county agencies with whom a psychiatrist meets monthly. This body of administrators acts as a steering committee for the entire program, sets policy, plans, coordinates, evaluates, and determines allotment of time and financing. Broad framework is set up, but each agency has freedom in how it uses its share of psychiatric time. The total program involving all county agencies concerned in 1948 originally commanded 3 hours weekly from one psychiatrist. In 1958, there are 68 hours available from 9 psychiatrists.

In the beginning, after a few sessions of the health department with the psychiatrist we saw that we needed to learn how to deal with mental health problems and how they affected us personally. Staff members' personal problems relating to their job success called for consideration and understanding. For certain of our personnel, difficulties in work situations and interpersonal office relationships had to be remedied for more effective functioning within the staff, with other agencies, and with clients. It also became apparent that the staff members did not clearly understand their responsibilities or the goals they were trying to achieve.

Thus, through 1954, the psychiatrist served primarily as a consultant on administrative problems at various levels. The purpose here

was to ease interpersonal relations and to improve our understanding of emotional problems.

Nurses Assigned Patients

During 1954, the health department's opinion crystallized into the belief that the real need for psychiatric consultation lay in providing the nursing staff with the specific management techniques and didactic materials that would enable them to help their patients.

The health officer decided, without much group support and with some misgivings of the staff and the psychiatrists, that the majority of psychiatric time should be used to supervise, directly or indirectly, nurses who would be assigned emotionally disturbed patients. It was reasoned that the nurses would develop a better understanding of psychological procedures if they were confronted with a specific patient who had an acknowledged need for mental health guidance. Responsibility for an emotionally disturbed patient would plunge the nurse into actual work in this field. It was also reasoned that individual casework would provide good material for lectures and group discussions of the problems encountered.

Opponents reasoned that the plan would precipitate personnel into an assignment they were not prepared for. The health officer interpreted this argument as being almost a restatement of his own feelings that the years of discussions were simply postponing and probably encouraging avoidance of dealing with emotional problems.

The issue was resolved by the inception of our present system of public health nurse followup. In order to make such an extensive approach feasible, the department created the position of mental health nursing consultant and employed a public health nurse with special training.

Cases are chosen from among clients who come to the county hospital psychiatric unit, or from those found by the public health nurse among her district clients, and whose diagnosis indicates no frank psychosis or outstanding need for hospitalization. The patients chosen are often unable or unwilling to come to a psychiatrist, but can be visited in their homes or they can visit the public health nurse in her

district office. Assignments are made according to the client's place of residence; our public health nurses are generalized and have geographic districts. Each patient determined to be psychiatrically suitable is invited to a discharge conference attended by the field public health nurse and her supervisor, our mental health consultant, the psychiatrist, and the chief nurse of the hospital's psychiatric unit. After a professional discussion, the psychiatrist asks the patient to join the conference, introduces him, and holds a short interview for the benefit of the nurse. The patient then retires and the group completes its discussion.

This conference establishes a working diagnosis, explains the personality of the patient, indicates his past and expected behavior, and presents social, home, cultural, and economic factors. The nurse receives suggestions and recommendations regarding her relationship to the patient and the patient's environment, and has an opportunity to express her own feelings about the particular patient, whether they be inadequacy, fears, or conflicts. The psychiatrist can help the nurse understand her feelings. The conference enables the supervisor to understand the case and the feelings of the nurse, and to see how they are handled by the psychiatrist. It provides an opportunity for the supervisor to ask questions pertaining to her own role, the field nurse's plan for assistance, and related matters. The patient is given a chance to meet the nurse through the psychiatrist and to make an appointment for nursing visits.

If the public health nurse has additional problems during home or office followup, she returns to her supervisor for consultation. If the supervisor feels unable to assist, both turn to the mental health consultant, who spends approximately one-half of her time assisting the field staff and their supervisors with such cases. If necessary, the mental health consultant arranges for further interviews with the psychiatrist, who occasionally reevaluates the case. The mental health consultant also has 1½ hours a month for individual consultation with the psychiatrist.

The psychiatrist is also available every other month for a 1-hour meeting with each group of nurses and their supervisors in the six dis-

tricts and the mental health consultant. In addition, 2 hours are available monthly for the entire supervisory group and the nurse consultant. This time may be used to discuss cases presented from the field, whether previously seen by a psychiatrist or not, or to have the psychiatrist fulfill specific requests for lectures and discussion materials.

In 2 years, 1955 and 1956, approximately 250 cases were the subject of psychiatric consultation. Service ranged from a single visit to a series of 60 regular nursing home visits over the 2-year period. Although we are impressed with the results of extending the psychiatrist's services beyond direct contact with patients, we realize that only a small part of the total mental health problem is being touched with our field services.

As a result of this program, the public health nurses are generally satisfied that they are beginning to understand dynamic psychiatry and are putting it to use in their own actions and relationships to patients. Generally, it seems that acknowledging responsibility for services to emotionally disturbed persons is a marvelous learning experience. Prior to actual assignment of cases, didactic information and discussion had not really stimulated the nurses to positive action in dealing with cases of emotional disturbance that are inevitably part of their caseload. Some nurses, however, are not yet able to work with such cases or certain kinds of cases.

The district supervisors without case experience and the higher echelon of nursing supervision now desire the same opportunity. Five out of eight have requested and have been assigned disturbed persons. For theoretical and administrative reasons the supervisory groups should not lag behind the field personnel in understanding, and they also confer with the mental health consultant. It may well be that the top administrative ranks, including health officers, will wish to be assigned disturbed persons, serving what might be called psychiatric internships.

Responsibility for Program

At the same time that nurses were given the direct responsibility for assisting selected emotionally disturbed patients, the assistant health

officer in charge of venereal disease control was given responsibility for the mental health program. This physician is not a psychiatrist, but he has participated in the evolving programs during most of the 10 years and recently worked briefly on the psychiatric staff of a State hospital. In addition, he has been assigned to represent the department's non-nursing activities in community mental health. Under his direction a manual has been developed outlining the plans under way in each division of the health department and the role that each employee plays in the mental health program. We believe that official assignation adds prestige to the activities and provides a tangible means of direction, continuity, and evaluation.

Community Activities

In addition to the public health nursing activity in the emotionally disturbed cases, we are concurrently engaged in several community activities to promote mental health. We have augmented the maternal and child health programs, encouraged family life education courses, worked with voluntary agencies, and have developed a cooperative arrangement with the California State Department of Mental Hygiene, the agency responsible for the rehabilitation of county residents discharged from the State mental hospital.

Family Life Education

The foundation for mental health, much like the foundation for physical health, is laid early in childhood. Preventing mental ill health and creating a sound family life through family life education in the school are activities that take into account future generations. Many maintain that this is the responsibility of parents, but too few parents are adequately informed. Many are hesitant; others are unhappily married or do not have the time or the desire to provide this training. On the other hand, the careful integration of courses in family living, from kindergarten through college, can help in the creation of responsible parents whose children will be healthier mentally and more stable emotionally.

In 1953, a survey of all county schools revealed courses in family living were largely

absent, particularly in grade schools. At that time, the health department has attempted to stimulate school administrators, parent groups, church groups, and others to family life education courses in schools. This is done by such means as teaching and assisting with films and reference materials. To expedite school and community acceptance of courses on human development, venereal disease, and similar topics, a professional person is sometimes needed. Thus, the assistant health officer in charge of mental health or person chosen by him may be the initial lecturer. With regard to the arranging of curriculum and teaching as a job for trained school personnel, an attempt is made to tell the school personnel how to give the course, nor do we teach, except as explained above. However, the assistant health officer offers guidance in areas to be covered. Whenever it appears that a particular school district has some interest in the topic, whether in elementary or secondary schools, the health department adds its weight to the movement.

Maternal and Child Health

Special mental health problems seem to cluster about certain groups in the population, many well known to the health department. Pregnant women constitute one of the major groups. In the maternal and child health program, both the clinic services and home calls to pregnancy cases are geared to a consideration of the special problems, particularly those of unwed mothers.

Another area of tremendous scope is our program for the newborn, the infant, and the preschooler. Here, the nurse through her home visits and the clinicians in well-child conferences have opportunities to work with special risk groups in allaying fears, offering advice, understanding parental anxieties, and paving the way for a more normal childhood. Our specialist director of maternal and child health supervises the clinicians. We have at times paid for and provided courses on growth, development, and emotional needs for these physicians. Rather than have a full-time specialist staff, we prefer employing part-time clinicians who are general practitioners in the community. Our objective has been to spread more of the mental health "know-how" among

the doctors through special training. We hope they will provide more preventive care to families in their own practices through their increased awareness and interest in foresighted guidance.

Other major programs are currently geared to consideration of the mental health aspects likely to be associated with the primary conditions for which the program was created.

Our crippled children's services offer opportunities for dealing not only with handicapped children but also with parents who experience rejection, guilt, inadequacy, unwillingness to go ahead, and related difficulties. Our tuberculosis and venereal disease programs particularly offer many challenges. Here again fears, guilt feelings, domestic problems, and potential socioeconomic losses are expected to engender or worsen emotional disturbances. In these, our nursing services in particular (to a lesser extent our clinic services) can be of great help. In many instances we have been of fundamental assistance to our clients in their emotional problems.

Assisting Voluntary Agencies

Nationwide, a great need is recognized for public education and support in mental health. Voluntary citizens groups and associations are major means of realizing these goals. Recognizing this, our health department stimulates and assists many organizations dealing broadly with mental health or various facets of it. Responsibility for this endeavor rests largely with the assistant health officer in charge of the mental health program. It has also been shared by the health officer and by the assistant health officers (particularly those in charge of maternal and child health, crippled children's services, and school health), health educators, and the public health nursing staff.

Characteristically, the organizations dealing with mental health have been small, with limited budgets, personnel, and activities. The health department participates in organizing, developing programs, and forming policy. Clerical assistance, health education materials, and press releases are provided during crises, especially in the early development of a voluntary agency. Usually the department does not provide "legwork" for voluntary agencies, since

we feel they can promote their cause better when their services are carried out by participating volunteers.

Members of the health department's staff are often members of the board of directors or committees of an agency and frequently are on the speaker's bureau. However, staff members do not accept executive positions such as president or chairman of a voluntary agency or its committees. We believe community voluntary workers should formulate a truly community program and avoid the possibility of being dominated by official agencies or of becoming an "arm" of the health department.

Since we must spread ourselves thin by participating in many voluntary agencies, we are constantly aware of the importance of assessing the value and goals of each agency in relation to the mental health and the total health picture. We attempt to devote our limited time to programs in which the most can be accomplished, preferably with the smallest investment of time and money. An example is our extensive participation in the Contra Costa-Alameda Epilepsy League. In our area, epilepsy is still neglected medically and shunned socially, and epileptics are rejected by schools and employers. The condition is comparatively easy and inexpensive to control, but does not receive a fraction of the attention justified compared with poliomyelitis or cerebral palsy, each of which it outnumbers sixfold.

Cooperating With the State

In the sphere of rehabilitation, we now work with the psychiatric social worker from the California State Department of Mental Hygiene, who has the legal responsibility for followup and rehabilitation of county residents discharged from the State mental hospital system. Our health department's role is primarily one of nurse cooperation. The nurse has a supportive relationship with some families and assists with the material needs of the discharged patient and his family.

The distances of the State hospitals from Contra Costa County have precluded a more direct relationship to date. However, our mental health consultant has established mutually helpful relationships with the nearby Berkeley outpatient clinic of the State Department of

Mental Hygiene. Previously, the health department and other agencies of the community referred cases there but immediately lost contact. We neither profited from the therapeutic experiences nor did we contribute in any way. Now we are able to furnish a more pertinent summary of findings and background on the patient and his family when we refer patients. In turn, the outpatient clinic provides the health department with pertinent information on these patients. The clinic, which has no home visiting services, has the benefit of our psychiatrically oriented staff.

Discussion

Certain basic tenets were assumed in determining the framework of the *original mental health program*.

1. Emotionally disturbed persons brought to an agency's attention are often in a phase of exacerbation and have passed through a prior phase in which the illness was less severe or fixed, but nevertheless under way (1).

2. It should be easier to reach such persons therapeutically at a time when their illness is less fixed, when they and others in their environment are less pessimistic in attitude. Presumably, at this time they can be assisted with a lesser expenditure of limited psychiatric resources (2).

3. It should be possible to provide many persons in the early stages of their disturbances with a supportive relationship through their contact with workers who are not psychiatrists but are employed by agencies whose work unveils emotional implications. If these workers are well indoctrinated in psychiatric principles and can work with psychiatric guidance, they should be able to accomplish a great deal. A. D. Schwartz, in an unpublished paper, calls them "caretaker persons" and points out that they may exist in or out of agencies or organizations. Those in agencies should be easier to mobilize.

4. It should be possible to utilize the services of a high proportion of professional people such as school guidance workers, probation case-workers, social welfare workers, medical social workers, public health nurses, teachers, and others. This group numbers about 1 percent of the general population and 2 percent of the

adult population and has a large number of public contacts as well as some psychological orientation.

5. It might be possible to transmit continuously a significant amount of psychiatric understanding and working know-how from the psychiatrist to these field workers. This would probably be most successful if the information were mediated by another small but strategically placed group of workers who are equipped with significant psychiatric skills. These are the psychologists, psychiatric public health nurses, and psychiatric social workers.

Restated, the field worker in a supportive relationship with many disturbed persons would work closely with skilled intermediaries who in turn would deal directly with the psychiatrist. In this way the limited services of a psychiatrist could be extended through many professional workers or "caretakers" to a great number of their contacts. We have called this the "trickle down" approach.

The team headed by a psychiatrist has to develop an appreciation of community problems, socioeconomic groups, cultural patterns, organizations, and governmental agencies. Through an extensive training program (which we think should include closely supervised work with a limited number of clients), the psychiatrist helps train several echelons of mental health workers. The more psychiatrically skilled of these (in the health department, this would be the nurse mental health consultant) would primarily assist him by acting as consultants to the field workers. The field workers promote mental health concepts through the use of specific preventive techniques geared to the various groups of their "at risk clients." The field workers learn early to recognize emotional problems near their inception. The workers handle cases when they feel capable and refer more difficult ones to higher echelons. When a nurse assists in rehabilitating a posthospital or clinic patient referred to her, she receives instructions from the psychiatrist in order to achieve optimal family and community adjustment and acceptance for the patient.

Field personnel have many contacts with personal health problems and defects revealed by screening procedures or law enforcement activities. If clients are approached suitably, the

agency's goals are more likely to be achieved, and anxiety-producing situations are minimized. The worker's growth and increased skills in interpersonal relations enable him to avoid recalcitrancy, and possibly enable him to prevent violations of the law that result in legal prosecution with its antisocial and mental health consequences for the individual and his family.

Appreciation by the oriented worker of the need to define choices clearly for the potential law violator or victim of disease can be the stimulus for healthy decisions and the patient's moral growth. Our health department has seen successful contacts alter the attitude of fairly well-confirmed antisocial persons and apparently help reincorporate them into the community. By contrast, we have maneuvered persons into becoming hostile recalcitrants, even though they have really never before come afoul of basic community requirements.

Among the benefits that were foreseen in well-planned, psychiatric indoctrination was the clarification of administrative relationships. The very necessary administrative hierarchy is automatically an imposition in a democracy and resentments, always difficult to overcome, block communications and lead to misunderstandings (3). Any improvements in the field worker's understanding and acceptance of the proper exercise of authority and worker-supervisor relationships should result in less ambivalent feelings at the field level about law enforcement and the functions to be accomplished with clients. In strengthening the worker's ability to win the client's cooperation, the accomplishment is much more gratifying. Well-established communication lines that permit the worker to transmit his thoughts about his client help the agency do its job.

We also find more understanding between agencies. Frequently dealing with the same families, agencies often follow upon one another's footsteps and interfere with one another's attempts to assist a client. An appreciation of another agency worker's policies, legal limitations, and problems is therefore essential. Each affects the client whose welfare and peace of mind, if properly promoted, can lead to the amelioration of his status or his dismissal from the category of "client." By mutual agreement, basic work with a family

can be assigned to the one agency worker most concerned. Success in this area involves extensive free-flowing communications. It is our feeling that our mental health program has paid for itself by keeping administration and worker lines of communication open.

For the price of inservice training, it has been possible to expedite the administrative duties and functions of the health department. Fixing responsibilities for our mental health program in addition to the inservice training has succeeded in interesting everyone in the emotional aspects of their services.

We also feel that we can extend the community psychiatric resources through public health nursing services. This has not been inexpensive, but examination of a few apparently successful case histories indicates that for a very few hours and dollars large individual community savings are achieved.

Cost is not the only factor. A clinic cannot serve some of the clients that we do because some persons are not adequately motivated to seek help from a psychiatrist or clinic, nor do they require hospitalization. A nurse's relationship with a patient can be more felicitous; for a patient initially is likely to be less awed by a nurse's presence than a doctor's. A nurse may also be accepted by persons who will not deal with anyone having a psychiatric label. At least in a few cases, it was only after a good many home visits by a nurse that the patient's attitude changed enough to induce him to avail himself of psychiatric services.

Summary and Conclusions

The Contra Costa County Health Department's mental health program, although incomplete and inadequate from the standpoint of the whole problem, has explored and incorporated several projects in prevention of mental illness.

Promotion of mental health is carried out in all our general programs, including those in sanitation. More specifically, our maternal and child health program is geared to this approach in prenatal, parental, and child guidance. Encouragement of family life education in schools is a similar activity.

Limitation of apparent disturbances are also of major concern in these programs and par-

ticularly in our crippled children's, tuberculosis, venereal disease, and chronic disease services.

Direct assistance to the emotionally ill and to those being rehabilitated during or following therapy is a specific activity of our mental health program.

We feel that the health department's limited use of a consulting psychiatrist, extensive use of a nurse mental health consultant, and reliance on field nursing for patient supervision is one successful approach in furthering mental health. Proper indoctrination and training enables our field staff to help with many lesser conditions and to recognize and refer the more severe to the more psychiatrically skilled. Utilization of professional "caretaker" personnel seems to be an economical and feasible way to get mental health services to a great number of persons, particularly when psychiatric services are minimal or absent.

Most of the nursing field staff did not work readily with families or individuals with mental health difficulties until given specific case assignments. Classes and case presentations became of more value once the nurses had specific

cases and needs. Heavy turnover of nursing personnel makes it unlikely that usual inservice training or course work can be expected to prepare the staff as successfully as actual case responsibility with good supervision and consultation under overall guidance of psychiatrists.

There was need to formalize our mental health activities into a specific program and to assign an assistant health officer as program director. The program's importance was thereby recognized and responsibility for direction, supervision, and evaluation was established.

Administrative improvements, intra-agency and interagency relationships have been a major consideration with particularly significant gains in the latter.

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- (2) Querido, A.: The Amsterdam psychiatric first aid scheme and some proposals for new legislation. *Proc. Roy. Soc. Med.* 48: 741-748, September 1955.
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Course in Laboratory Methods in TB Diagnosis

A course in laboratory methods in the diagnosis of tuberculosis is offered by the Microbiology Laboratories of the Communicable Disease Center, Public Health Service, Chamblee, Ga., in cooperation with the Service's Division of Special Health Services. The course, scheduled for October 20-31, 1958, and for January 26-February 6, 1959, is open to all grades of employed laboratory personnel who have the approval of their State health officers.

The training includes preparation of culture media, microscopy, cultural procedures, diagnostic use of animals, and testing of drug sensitivity. Students attending will be offered a "student extension service" for a period of 1 year following termination of the course.

No tuition or laboratory fees are charged. Reservations for this course should be made well in advance, since the size of each class is limited to 12.

Application forms may be obtained from the Laboratory Branch, Communicable Disease Center, Public Health Service, P. O. Box 185, Chamblee, Ga.

A study of referrals to public health agencies among 1,263 households showed that the majority of the time and patient-nurse contacts are devoted to the first patient, and usually less than two additional patients come from the same household.

Public Health Nursing Service Provided in Households

MARION FERGUSON, R.N., Ph.D., and MARY ELLEN PATNO, Ph.D.

THE AMOUNT of public health nursing service needed by patients under the care of local health departments has been the subject of much speculation, the topic of many conferences, formal and informal, and the research objective of various studies. This report deals with one aspect of the problem—the amount of public health nursing service that ensues in a household as a result of the referral of the first patient.

Source of Data

The basic data for this report were collected by 2 nurses in each of 8 health agencies in 5 States over a period of 2 years. The agencies were the Frederick County Health Department, Maryland; Detroit Department of Health and Washtenaw County Health Department, Michigan; Rochester Health Bureau and Tompkins County Health Department, New York; Forsyth County Health Department, North Carolina; and the Fredericksburg Health District and the Community Nursing Service of Richmond, Virginia.

Dr. Ferguson is chief of Public Health Nursing Studies, Division of General Health Services, Public Health Service. Dr. Patno is assistant professor of biostatistics, Graduate School of Public Health, University of Pittsburgh.

These agencies met the criteria of the American Public Health Association for health department programs, and the nurses fulfilled the criteria of the American Nurses' Association and the National League for Nursing for public health nursing programs, staffing patterns, and basic public health nursing preparation of the staff. These agencies and nurses also were ones that, in the professional judgment of the responsible State health officials, were maintaining standards of good public health practice (1).

Households in this study comprised all persons living in one dwelling unit, such as an apartment or a private dwelling, but did not include family members living elsewhere. Beginning with referrals on February 1, 1954, each nurse admitted for study the households of the first 10 patients referred in each category of service where the agency assumed responsibility. Thereafter, she recorded, among many other items, the amount of service provided to all members of the household from the time of referral to discharge or for a period of 1 year, whichever came first.

The participating agencies provided services in all areas usually considered health department responsibility, but the number and type of categories used in reporting service varied considerably from agency to agency. Because

of this variation, all initial patients and their corresponding households were reclassified by the study staff for purposes of uniformity. As a result, some categories used in this report have more than 160 initial patients and households. Many have fewer than 160 initial patients, partially because of the reclassification, but mainly because fewer than the desired number of patients were referred to the individual nurse during the year when field data were collected.

In all, 1,263 households were studied. They included 5,779 members, 2,984 of whom received service from the public health nurse. Forty-two percent of the initial patients in these households were referred for nursing service by various divisions of the health department itself. Private physicians and hospitals referred 22 percent, while the patient or his family accounted for 16 percent. School referrals amounted to 11 percent; all other sources, 9 percent.

For tuberculosis, infant health supervision, and maternity, most referrals came from the health department. The patient and family were also frequent sources of referral for maternity and infant health supervision. Referrals from physicians were more numerous in noncommunicable disease, chronic illness, and tuberculosis than in other categories. The school referrals were mostly of school-age children for physical defects or for behavior or emotional problems.

Index of Additional Patients

Referral of the initial patient in a household has been assumed to lead to service for other members of the family. This is one of the bases for advocating generalized public health nursing service. In this study, service to other members of the households is demonstrated by the ratio of the number of additional patients to the number of initial patients. The resulting index simply describes the average number of added patients per a first referral.

The index of additional patients varies from one service category to another (table 1). When the initial referral was classified as tuberculosis, the index was 2.0 which means that, on the average, 2 patients in addition to the initial patient in the household received service. This was the

highest index. The lowest index, 0.5, occurred when the initial referral was venereal disease.

The magnitude of the index, or the number of additional patients per household, appears to be virtually independent of the size of household and related primarily to the category of the initial patient. For example, households initially admitted as tuberculosis averaged 4 members, 77 percent of whom became patients (index 2.0). In the mental health category, however, households were larger on the average, 4.7 members, but only 38 percent of the members became patients (index 0.8).

The index based on all households and their patients has been omitted purposely from table 1. The households studied were not selected with the view that they would reflect a total caseload. They were selected, instead, to reflect what occurred within a service category. Consequently, all figures derived from the basic data must be considered by category only.

Service Categories of Additional Patients

When service categories were considered separately, additional patients were usually in categories different from that of the initial patient (table 2). The greatest exception was in the tuberculosis category where 82 percent of the added patients were also classified as tuberculosis. This exception is easily understood because the category includes suspects and contacts as well as cases of tuberculosis. Similarly, 58 percent of the additional patients resulting from a venereal disease referral and 42 percent of those from a communicable disease referral were in the same category as the initial patient.

Subcategories in health supervision are determined by the age of the patient. This accounts for most of the additional patients being in a different group than that of the initial patient. For example, only 3.7 percent of the additional patients resulting from an initial referral for infant health supervision were in the same category. This is to be expected. Few households include two infants simultaneously or over a short period of time.

Because of the age factor in health supervision and because child health supervision is usually associated with maternity service, a broader grouping including health supervision

and maternity was made. With these categories grouped, 89.5 percent of the additional patients were in this larger category.

Patient-Nurse Contacts

In previous studies, terms such as interview, visit, and conference have been used to identify

the services given by the public health nurse to or in behalf of the patient. Because specific and often diametrically opposed definitions of these terms have been developed to meet particular needs in various situations, they are not used in this report. Instead, a term "patient-nurse contact" (PNC) has been employed. This term covers all services to or in behalf of the

Table 1. Index of additional patients

| Category of initial patient | Average household size | Number of initial patients (households) | Number of additional patients | Percent ¹ patients | Index ² |
|------------------------------------|------------------------|---|-------------------------------|-------------------------------|--------------------|
| Orthopedic..... | 4.8 | 64 | 67 | 42.4 | 1.0 |
| Chronic disease ³ | 3.7 | 126 | 89 | 46.1 | .7 |
| Communicable disease..... | 5.3 | 92 | 102 | 39.9 | 1.1 |
| Tuberculosis..... | 4.0 | 178 | 365 | 76.6 | 2.0 |
| Veneral disease..... | 3.7 | 36 | 19 | 41.7 | .5 |
| Infant..... | 4.7 | 230 | 348 | 53.7 | 1.5 |
| Preschool..... | 5.3 | 47 | 81 | 51.2 | 1.7 |
| School..... | 5.3 | 71 | 64 | 36.1 | .9 |
| Adult health..... | 5.5 | 4 | 7 | 50.0 | 1.7 |
| Antepartum..... | 5.1 | 160 | 279 | 54.2 | 1.7 |
| Postpartum..... | 4.6 | 111 | 183 | 57.9 | 1.6 |
| Mental health..... | 4.7 | 71 | 55 | 38.0 | .8 |
| Noncommunicable disease..... | 4.2 | 73 | 62 | 44.4 | .8 |

¹ Total patients in household/total persons in household.

² Number of additional patients/number of initial patients.

³ Includes cancer, cardiovascular, and other chronic diseases.

Table 2. Relation of category of additional patients to that of initial patient

| Category of initial patient | Number of initial patients | Additional patients in households | | | | |
|---|----------------------------|-----------------------------------|----------------------------------|---------|---|---------|
| | | Total | Same category as initial patient | | Different category from initial patient | |
| | | | Number | Percent | Number | Percent |
| Health supervision and maternity service..... | 623 | 962 | 861 | 89.5 | 101 | 10.5 |
| Infant..... | 230 | 348 | 13 | 3.7 | 335 | 96.3 |
| Preschool..... | 47 | 81 | 22 | 27.2 | 59 | 72.8 |
| School..... | 71 | 64 | 7 | 10.9 | 57 | 89.1 |
| Adult health..... | 4 | 7 | 1 | 14.3 | 6 | 85.7 |
| Antepartum..... | 160 | 279 | 3 | 1.1 | 276 | 98.9 |
| Postpartum..... | 111 | 183 | 0 | 0 | 183 | 100.0 |
| Communicable diseases..... | 306 | 486 | 360 | 74.1 | 126 | 25.9 |
| Tuberculosis..... | 178 | 365 | 298 | 81.6 | 67 | 18.4 |
| Veneral disease..... | 36 | 19 | 11 | 57.9 | 8 | 42.1 |
| Others..... | 92 | 102 | 43 | 42.2 | 59 | 57.8 |
| All others..... | 334 | 273 | 59 | 21.6 | 214 | 78.4 |
| Chronic disease ¹ | 126 | 89 | 9 | 10.1 | 80 | 89.9 |
| Orthopedic..... | 64 | 67 | 3 | 4.5 | 64 | 95.5 |
| Noncommunicable disease..... | 73 | 62 | 10 | 16.1 | 52 | 83.9 |
| Mental health..... | 71 | 55 | 9 | 16.4 | 46 | 83.6 |

¹ Includes cancer, cardiovascular, and other chronic diseases.

Table 3. Patient-nurse contacts per household referral

| Category of initial patient | Number of patient-nurse contacts per household | | | | | Percent | |
|------------------------------------|--|------------------|---------------------|-------------------------------------|--|-----------------|---------------------|
| | Total | Initial patients | Additional patients | Average for each additional patient | Ratio initial patient to additional patients | Initial patient | Additional patients |
| Orthopedic..... | 14.3 | 10.8 | 3.5 | 3.3 | 3.3 | 75.5 | 24.5 |
| Chronic disease ¹ | 24.8 | 21.5 | 3.3 | 4.6 | 4.7 | 86.7 | 13.3 |
| Communicable disease..... | 12.3 | 6.0 | 6.3 | 5.7 | 1.1 | 48.8 | 51.2 |
| Tuberculosis..... | 23.5 | 14.2 | 9.3 | 4.5 | 3.2 | 60.4 | 39.6 |
| Venereal disease..... | 7.9 | 6.0 | 1.9 | 3.6 | 1.7 | 75.9 | 24.1 |
| Infant..... | 11.2 | 6.3 | 4.9 | 3.3 | 1.9 | 56.2 | 43.8 |
| Preschool..... | 11.7 | 4.7 | 7.0 | 4.0 | 1.2 | 40.2 | 59.8 |
| School..... | 11.7 | 7.5 | 4.2 | 4.7 | 1.6 | 64.1 | 35.9 |
| Adult health..... | 17.5 | 11.0 | 6.5 | 3.7 | 3.0 | 62.9 | 37.1 |
| Antepartum..... | 19.2 | 10.7 | 8.5 | 4.9 | 2.2 | 55.7 | 44.3 |
| Postpartum..... | 13.5 | 5.0 | 8.5 | 5.1 | 1.0 | 38.5 | 61.5 |
| Mental health..... | 15.4 | 11.6 | 3.8 | 4.8 | 2.4 | 75.3 | 24.7 |
| Noncommunicable disease..... | 13.9 | 10.7 | 3.2 | 3.7 | 2.9 | 77.0 | 23.0 |

¹ Includes cancer, cardiovascular, and other chronic diseases.

patient, regardless of the place of service (such as home, office, or clinic), the other person involved (such as patient, social agency representative, or physician), or the means (such as home call, telephone, or letter).

The number of patient-nurse contacts was considered by household, initial patient, additional patients as a group, and individual additional patients (table 3). This table shows that the greatest number of PNC's to a household (24.8) occurred when the initial referral was classified as cancer, cardiovascular disease, or other chronic disease. Also, 87 percent of the patient-nurse contacts in this group were for the initial patient. At the other extreme, only 7.9 PNC's per household were made when the initial referral was classified as venereal disease.

One special point of interest is found in the field of child health supervision. When only the total PNC's to a household are considered, the age of the initial patient makes little difference. When the initial patient was an infant, 11.2 patient-nurse contacts per household were recorded; when a preschool or school child was referred, 11.7 PNC's were made.

In all but three categories (communicable disease, preschool health supervision, and postpartum), the initial patient received more than half of the total PNC's. Furthermore, in all categories except one (postpartum) the average number of patient-nurse contacts to initial

patients exceeded the average number for individual additional patients. In fact, in seven categories, the average number of PNC's to the initial patient was more than double that for individual additional patients. In the postpartum category, the initial patients averaged 5.0 patient-nurse contacts and additional patients, practically all of whom were children, averaged 5.1 (table 3).

Whether reporting under study conditions differs from routine reporting is always a question in any study such as this. A limited answer to this question was obtained by pooling the annual reports of the participating agencies and comparing these data with those of the study. The annual reports provided the number of patient-nurse contacts per patient in the home setting. Similar averages were

Table 4. Home patient-nurse contacts per patient

| Category of service | Study | Pooled annual reports |
|---|-------|-----------------------|
| Chronic disease, orthopedic, and noncommunicable disease..... | 7.6 | 8.6 |
| Communicable disease and venereal disease..... | 2.8 | 2.1 |
| Tuberculosis..... | 3.8 | 1.0 |
| Maternity..... | 4.4 | 3.0 |
| Health supervision..... | 3.4 | 3.2 |

obtained from the study data on contacts occurring in the home (table 4). A comparison of the several averages suggests that the number of patient-nurse contacts in the home was neither over-reported nor under-reported by the nurses who provided the basic data.

Time for Patient-Nurse Contacts

Time spent in giving nursing service is even more important than the frequency of service in relation to an agency's personnel needs or the setting of priorities within an agency. In this study, nurses reported the time required for actual service. Travel time was excluded because it varies with local geography and means of transportation. The time reported included both preactivity and postactivity as well as the time spent in giving direct service. In other words, total time included that spent in reviewing the patients' records, collecting literature or other supplies, packing nurse's bag, recording on the patients' records, and similar activities, as well as the time spent with the patient.

Time per household ranged from 2.3 hours for households where the initial referral was for venereal disease to 10.7 hours for those where the first referral was for cancer, cardiovascular disease, or other chronic disease (table 5). As might be expected the extremes for time

spent in direct service and in preactivity and postactivity were also found in these two categories, since any direct service requires a certain amount of preactivity and postactivity.

The proportion of time spent in direct service was fairly constant from one category to another, even though there was great variation in the amount of direct service. It ranged from 68 percent in households in the postpartum category to 76 percent in households in the category of cancer, cardiovascular disease, and other chronic disease.

Except for the postpartum and preschool categories, the initial patient received more than half of the time given to the household. The initial patient also received more time, on the average, than any individual additional patient except those in the postpartum category.

Comparison of tables 5 and 3 shows that the difference in the amount of service given to the initial patient and that to the additional patients is even more marked when time is considered rather than frequency of service.

Combination Agencies and Health Departments

Combination agencies have been defined in the National League for Nursing's Public Health Nursing Achievements and Goals as "a service jointly administered and jointly financed by official agencies (including boards of education)

Table 5. Hours of nursing service per household

| Category of initial patient | Hours | | | | | | | Percent | |
|------------------------------------|-------|------------------------|----------------|-----------------|---------------------|-------------------------------------|--|-----------------|---------------------|
| | Total | Pre- and post-activity | Direct service | Initial patient | Additional patients | Average for each additional patient | Ratio initial patient to additional patients | Initial patient | Additional patients |
| Orthopedic..... | 5.0 | 1.3 | 3.7 | 4.0 | 1.0 | 1.0 | 4.0 | 80.0 | 20.0 |
| Chronic disease ¹ | 10.7 | 2.5 | 8.2 | 9.8 | .9 | 1.3 | 7.5 | 91.6 | 8.4 |
| Communicable disease..... | 3.9 | 1.1 | 2.8 | 2.3 | 1.6 | 1.4 | 1.6 | 59.0 | 41.0 |
| Tuberculosis..... | 6.8 | 1.6 | 5.2 | 4.7 | 2.1 | 1.0 | 4.7 | 69.1 | 30.9 |
| Venereal disease..... | 2.3 | .7 | 1.6 | 1.8 | .5 | 1.1 | 1.6 | 78.2 | 21.8 |
| Infant..... | 4.4 | 1.4 | 3.0 | 2.7 | 1.7 | 1.1 | 2.5 | 61.4 | 38.6 |
| Preschool..... | 3.5 | 1.0 | 2.5 | 1.5 | 2.0 | 1.2 | 1.2 | 42.8 | 57.2 |
| School..... | 3.5 | 1.0 | 2.5 | 2.2 | 1.3 | 1.4 | 1.6 | 62.8 | 37.2 |
| Adult health..... | 5.0 | 1.4 | 3.6 | 3.7 | 1.3 | .7 | 5.3 | 74.0 | 26.0 |
| Antepartum..... | 7.3 | 1.9 | 5.4 | 4.5 | 2.8 | 1.6 | 2.8 | 61.6 | 38.4 |
| Postpartum..... | 5.3 | 1.7 | 3.6 | 1.9 | 3.4 | 2.0 | 1.0 | 35.8 | 64.2 |
| Mental health..... | 6.0 | 1.8 | 4.2 | 4.7 | 1.3 | 1.8 | 2.6 | 78.3 | 21.7 |
| Noncommunicable disease..... | 5.1 | 1.3 | 3.8 | 4.2 | .9 | 1.1 | 3.8 | 82.4 | 17.6 |

¹ Includes cancer, cardiovascular, and other chronic diseases.

and voluntary agencies, with all field service rendered by a single group of public health nurses" while health departments are entirely tax supported.

These agencies differ in their policies as to the types and extent of the nursing service they provide.

Combination agencies assume more responsibility for long-term nursing care of the sick and disabled than do health departments. The combination agencies give nursing care of the sick and disabled as part of a continuing nursing service in homes, while health departments usually give such care only on a demonstration basis.

Because of differing policies, the data were examined according to the type of agency providing care (table 6). In general, the 3 combination agencies reported a few more additional patients than did the 5 health departments. Also, with the exception of venereal disease and child health supervision, the combination agencies reported more patient-nurse contacts per household. Finally, more time was spent by the combination agencies per household in every category except noncommunicable disease.

Summary and Discussion

In this study of 1,263 households and the public health nursing service they received,

three measurements have been used to describe the amount of service that ensues in a household as a result of the referral of the first patient. The first was the average number of additional patients per initial referral. This index was found to vary considerably with the service category of the first patient, and also appears to be virtually independent of the household size. In all service categories except tuberculosis, fewer than two additional patients were served per initial referral.

The second measurement was the number of patient-nurse contacts per household; the third, the number of hours spent in nursing service per household. Both of these measurements varied with the category of the initial patient and the variation was somewhat the same for the two measurements. This consistency in the variation was closely related to the fact that in most categories the initial patient received the majority of the patient-nurse contacts and the greater proportion of the time expended.

Time spent in preactivity and postactivity was studied as well as time spent in direct service to the patients. In all categories indirect service accounted for approximately 25 percent of the time expended, indicating that actual time with a patient or household is not the best measure for a work unit. A better one also takes into account the time spent for indirect service.

Table 6. Combination agencies and health departments

| Category of initial patient | Number of initial patients | | Index of additional patients | | Patient-nurse contacts per household | | Hours of service per household | |
|------------------------------------|----------------------------|-------------------|------------------------------|-------------------|--------------------------------------|-------------------|--------------------------------|-------------------|
| | Combination agency | Health department | Combination agency | Health department | Combination agency | Health department | Combination agency | Health department |
| Orthopedic..... | 12 | 52 | 1.4 | 1.0 | 12.8 | 14.6 | 5.2 | 5.0 |
| Chronic disease ¹ | 54 | 72 | .8 | .6 | 27.5 | 22.7 | 14.2 | 8.1 |
| Communicable disease..... | 44 | 48 | 1.1 | 1.1 | 13.6 | 11.2 | 3.9 | 3.9 |
| Tuberculosis..... | 57 | 121 | 2.1 | 2.0 | 27.1 | 21.8 | 7.8 | 6.4 |
| Venereal disease..... | 8 | 28 | .0 | .7 | 7.1 | 8.1 | 3.0 | 2.2 |
| Infant..... | 67 | 163 | 1.4 | 1.6 | 10.8 | 11.4 | 4.4 | 4.3 |
| Preschool..... | 20 | 27 | 1.7 | 1.7 | 10.9 | 12.2 | 3.9 | 3.3 |
| School..... | 21 | 50 | 1.1 | .8 | 10.7 | 12.2 | 4.1 | 3.2 |
| Adult health..... | 2 | 2 | 2.5 | 1.0 | 22.0 | 13.0 | 7.2 | 2.9 |
| Antepartum..... | 61 | 99 | 1.9 | 1.6 | 22.8 | 16.9 | 8.4 | 6.7 |
| Postpartum..... | 43 | 68 | 1.6 | 1.6 | 16.1 | 11.8 | 5.6 | 5.1 |
| Mental health..... | 15 | 56 | 1.5 | .6 | 16.2 | 15.2 | 6.7 | 5.9 |
| Noncommunicable disease..... | 41 | 32 | 1.0 | .7 | 12.5 | 15.7 | 5.0 | 5.3 |

¹ Includes cancer, cardiovascular, and other chronic diseases.

The study staff made an effort to select those agencies and nurses that represented good public health nursing practices. If this was accomplished, the data presented in this report might be used in estimating personnel needs.

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Radioactivity Study

Milk samples have been analyzed for specific radionuclides in a continuing study conducted by the Public Health Service in milksheds serving Sacramento, Salt Lake City, St. Louis, Cincinnati, and New York City. Analyses to date find that manmade radioactivity on the average is but a small fraction of the recommended permissible maximum and is but slight even in relation to the natural radioactivity of milk. The study, which began in April 1957, is part of the Service's broad program in environmental analysis, including tests for radioactivity in water, air, and food.

Milk was the food selected for the initial study because of its importance in the diet and its year-round and widespread production. Radiation may be measured as a total or gross level, or it may be broken down to show the level of radiation from each specific radioactive element. Specific measurements, although much more difficult to make, are important because health effects vary greatly among specific elements. In addition, because milk normally contains natural radioactive potassium, the study undertook the separate measurement of radiation from specific manmade nuclides.

With the cooperation of State and municipal health agencies and the dairy industry, a monthly 1-gallon sample is collected at a designated point in each milkshed. The sample is a composite of a day's delivery by a group of dairy farms.

The sampling points were set up by the Service's

regional milk and food consultants in accordance with the following criteria:

- The milk in each composite sample must be from a group of farms having, altogether, at least 1,000 cows.
- The number of individual farms in the sample must be small enough to make collection of field data on each farm feasible.
- The composite milk sample must be from a supply that is part of a major metropolitan milkshed.
- The conditions under which the milk is received must be such that milk from the same production area is represented in the composite sample collected each month.

Collateral information also is collected concerning feeding practices, water supplies, and breeds of dairy cattle typical of each area.

The average levels of radioactivity found in samples collected during the first year of the pilot program are expressed here in units of micromicrocuries per liter of milk. A curie is a measure of radioactivity equivalent to that produced by one gram of radium, and a micromicrocurie is one-millionth of a millionth of a curie. The levels are shown in the table.

Additional sampling points are being established in the milksheds serving Atlanta, Ga.; Fargo, N. Dak., and Moorhead, Minn.; Austin, Tex.; and Spokane, Wash; and in a milkshed in southern Wisconsin.

First year's average levels of radioactivity in milk samples (micromicrocuries per liter)

| City | Calcium (grams/ liter) | Iodine-131 (3,000) | Strontium- 89 (7,000) | Strontium- 90 (80.0) | Barium-140 (200,000) | Cesium-137 (50,000) |
|---------------------|------------------------------|-----------------------|--------------------------|-------------------------|-------------------------|------------------------|
| Sacramento..... | 1. 128 | 35 | 14. 7 | 3. 4 | 19. 5 | 32. 8 |
| Salt Lake City..... | 1. 137 | 27.4 | 34. 0 | 3. 8 | 54. 0 | 43. 7 |
| St. Louis..... | 1. 250 | 275 | 78. 3 | 7. 4 | 98. 5 | 40. 3 |
| Cincinnati..... | 1. 251 | 132 | 45. 4 | 5. 1 | 39. 2 | 27. 3 |
| New York City..... | 1. 076 | 82 | 42. 4 | 5. 8 | 46. 8 | 29. 7 |

Note: Numbers in parentheses are the maximum permissible concentrations for the specific nuclides in drinking water recommended by the National Committee on Radiation Protection and Measurement.

and voluntary agencies, with all field service rendered by a single group of public health nurses" while health departments are entirely tax supported.

These agencies differ in their policies as to the types and extent of the nursing service they provide.

Combination agencies assume more responsibility for long-term nursing care of the sick and disabled than do health departments. The combination agencies give nursing care of the sick and disabled as part of a continuing nursing service in homes, while health departments usually give such care only on a demonstration basis.

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Table 6. Combination agencies and health departments

| Category of initial patient | Number of initial patients | | Index of additional patients | | Patient-nurse contacts per household | | Hours of service per household | |
|------------------------------|----------------------------|-------------------|------------------------------|-------------------|--------------------------------------|-------------------|--------------------------------|-------------------|
| | Combination agency | Health department | Combination agency | Health department | Combination agency | Health department | Combination agency | Health department |
| Orthopedic | 12 | 52 | 1.4 | 1.0 | 12.8 | 14.6 | 5.2 | 5.0 |
| Chronic disease ¹ | 54 | 72 | .8 | .6 | 27.5 | 22.7 | 14.2 | 8.1 |
| Communicable disease | 44 | 48 | 1.1 | 1.1 | 13.6 | 11.2 | 3.9 | 3.9 |
| Tuberculosis | 57 | 121 | 2.1 | 2.0 | 27.1 | 21.8 | 7.8 | 6.4 |
| Venereal disease | 8 | 28 | .0 | .7 | 7.1 | 8.1 | 3.0 | 2.2 |
| Infant | 67 | 163 | 1.4 | 1.6 | 10.8 | 11.4 | 4.4 | 4.3 |
| Preschool | 20 | 27 | 1.7 | 1.7 | 10.9 | 12.2 | 3.9 | 3.3 |
| School | 21 | 50 | 1.1 | .8 | 10.7 | 12.2 | 4.1 | 3.2 |
| Adult health | 2 | 2 | 2.5 | 1.0 | 22.0 | 13.0 | 7.2 | 2.9 |
| Antepartum | 61 | 99 | 1.9 | 1.6 | 22.8 | 16.9 | 8.4 | 6.7 |
| Postpartum | 43 | 68 | 1.6 | 1.6 | 16.1 | 11.8 | 5.6 | 5.1 |
| Mental health | 15 | 56 | 1.5 | .6 | 16.2 | 15.2 | 6.7 | 5.9 |
| Noncommunicable disease | 41 | 32 | 1.0 | .7 | 12.5 | 15.7 | 5.0 | 5.3 |

¹ Includes cancer, cardiovascular, and other chronic diseases.

Table 1. Cumulative changes in status of fluoridation, by year, 1945-57

| Year | Fluoridation status at end of each year | | | Fluoridation discontinued ¹ | | | Fluoridation reinstituted after discontinuance | | |
|------|---|-----------------------------|-------------------------|--|-----------------------------|-------------------------|--|-----------------------------|-------------------------|
| | Number communities | Number water supply systems | Population ² | Number communities | Number water supply systems | Population ² | Number communities | Number water supply systems | Population ² |
| 1945 | 6 | 3 | 231,920 | | | | | | |
| 1946 | 12 | 8 | 332,467 | | | | | | |
| 1947 | 16 | 11 | 453,748 | | | | | | |
| 1948 | 24 | 13 | 581,683 | | | | | | |
| 1949 | 46 | 29 | 1,062,779 | | | | | | |
| 1950 | 96 | 62 | 1,578,578 | 1 | 1 | 16,550 | | | |
| 1951 | 339 | 171 | 4,948,259 | 2 | 2 | 29,450 | | | |
| 1952 | 717 | 353 | 13,552,501 | 7 | 7 | 202,122 | | | |
| 1953 | 965 | 482 | 17,080,930 | 14 | 14 | 253,738 | 2 | 2 | 166,466 |
| 1954 | 1,147 | 571 | 21,208,304 | 36 | 34 | 1,323,613 | 4 | 4 | 170,400 |
| 1955 | 1,300 | 668 | 24,796,043 | 64 | 52 | 1,717,653 | 6 | 6 | 184,372 |
| 1956 | 1,521 | 765 | 31,584,408 | 81 | 65 | 1,905,735 | 10 | 10 | 222,741 |
| 1957 | 1,631 | 870 | 33,294,899 | 94 | 69 | 2,097,955 | 13 | 13 | 289,081 |

¹ Total whether or not reinstituted.

² Most recently available population figures were used regardless of the year that fluoridation was instituted.

during 1957. During the same year, 3 communities, providing water to 66,000 people, reinstituted the measure after having previously discontinued it. During the years 1945 to 1957, a total of 94 communities discontinued fluoridation; of these, 13 reinstituted the measure (table 3).

Water supply systems are publicly owned in 84 percent of the communities in which the fluoride content is controlled. In cities with more than 500,000 people, 100 percent of the water systems are under public ownership. Eighty-eight percent of the systems are publicly owned in cities of from 25,000 to 500,000 population, 90 percent in places from 10,000 to 25,000, and 82 percent in places under 10,000.

Future Growth

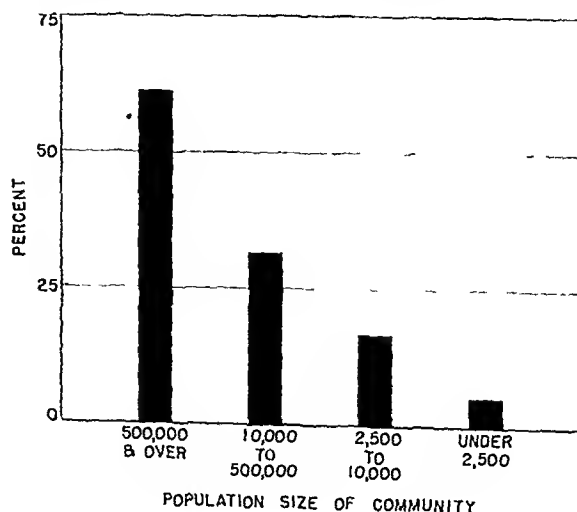
The major increases in the population provided with fluoridated water during the next few years is likely to be in the larger cities. However, in the more distant future the greatest increase will probably be in the smaller places where today only 5 percent have fluoridation programs. It is in towns of 2,500 or less that fluoridation will need to make its greatest advances.

Although fluoridation continues to be a mat-

ter of public discussion in certain parts of the country, there has been a decline in the number of communities discontinuing fluoridation over the past several years. The number of water supply systems discontinuing fluoridation in 1954 to 1956, for example, was 3 to 5 times greater than in 1957.

Interest in fluoridation programs in other countries is mirrored in the endorsements of re-

Figure 2. Percentage of communities fluoridating their water supplies, by size, December 31, 1957.



Status of Controlled Fluoridation in the United States, 1945-57

OF THE approximately 118 million people in the United States provided water by community water supplies in 1957, 40.3 million (or about 1 in every 3 persons) in 3,534 communities drank water containing the minimum or higher level of fluoride recommended for optimum dental benefits.

Of these 40.3 million persons, 33.3 million in 1,631 communities are supplied water in which the fluoride level is controlled, and 7 million in 1,903 places use water naturally containing 0.7 ppm or more fluoride. Since 1950, the number of persons using water with a controlled fluoride content has increased by about 32 million (table 1 and fig. 1).

Controlled Fluoridation

Fluoridated water is provided for a greater proportion of people living in large cities than in smaller communities (table 2). A majority of the Nation's cities having populations of a half million or more (12 of the 18) provide fluoridated water. These cities are:

| | |
|-------------------|-----------------------|
| Chicago, Ill. | San Francisco, Calif. |
| Philadelphia, Pa. | Pittsburgh, Pa. |
| Baltimore, Md. | Milwaukee, Wis. |
| Cleveland, Ohio | Houston, Tex. |
| St. Louis, Mo. | Buffalo, N. Y. |
| Washington, D. C. | Minneapolis, Minn. |

Two of the five cities with populations exceeding 1 million (Chicago and Philadelphia), and 9 of the 13 cities with populations ranging between a half million and a million have in-

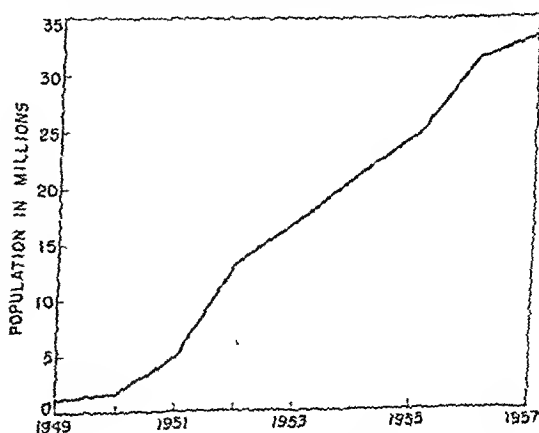
stituted fluoridation. Of these 13 cities, only one, Houston, Tex., provides water which naturally contains fluoride at a level of 0.7 ppm.

Of places with less than a half million population, 32 percent of those with a population between 10,000 and 500,000, 17 percent between 2,500 and 10,000, and 5 percent under 2,500 have fluoridation programs (fig. 2).

The authority by which fluoridation is instituted is of interest. In 82 percent of the cities fluoridating, the governing body of the community authorized adoption of the measure. In 5 percent authority to fluoridate was obtained by referendums, and in 4 percent the utilities commission authorized the measure. Nine percent of the communities did not specify authority or used other procedures in adopting fluoridation.

Fluoridation was discontinued in 13 communities providing water to 192,000 people

Figure 1. Population served with water to which fluoride has been added, 1949-57.



Prepared by the Division of Dental Public Health,
Bureau of State Services, Public Health Service.

A 1955 study demonstrates that the mere introduction of a highly virulent strain of poliomyelitis into a susceptible population is not enough to kindle a severe epidemic.

Poliomyelitis in Idaho After Use of Live Virus Vaccine

CARL M. EKLUND, M.D., E. JOHN BELL, Ph.D., and ROBERT K. GERLOFF, M.A.

FACTORS responsible for a poliomyelitis epidemic in the United States are not clear. Sporadic cases of poliomyelitis are reported every year and may be present at any season throughout the country. Epidemics, however, are geographically limited and are relatively infrequent. They have no apparent regularity but generally occur during the summer and early fall. It would appear that an epidemic should follow introduction of an especially virulent and invasive strain of poliovirus into a relatively susceptible population, but in an endemic area, it is not possible to establish the origin or introduction of such a strain.

An incident in Idaho during April 1955 gave an unparalleled opportunity to study a poliomyelitis outbreak. In that month two lots of commercially prepared vaccine were used to

immunize 32,000 children in the school program of the State. After the first series of inoculations, poliomyelitis appeared in the vaccinated children, and the immunization program was terminated. Subsequently, viable poliovirus of all three types was shown to be present in the vaccine lots used (1). The introduction of viruses into a human population at a known time and the ease with which subsequent events could be followed created a favorable environment for study of the epidemic.

Vaccine containing live virus was given at a time when poliomyelitis did not constitute a problem in Idaho. The vaccination program was conducted at least 2 months prior to the season when an increase in incidence would have been expected on the basis of past experience. Thus, polioviruses were introduced into a relatively susceptible population at a season which experience had shown to be unfavorable for the natural occurrence of poliomyelitis epidemics.

Idaho's first recorded poliomyelitis epidemic was in 1947, when 371 cases were reported. Other epidemics occurred during 1949 (510 cases) and 1952 (253 cases). In a population of approximately 600,000 people, 1,884 cases were reported during the 8-year period from 1947 through 1954.

Our conclusions regarding conditions necessary for the occurrence of a poliomyelitis epi-

The authors are all with the Rocky Mountain Laboratory, National Institute of Allergy and Infectious Diseases, Public Health Service, Hamilton, Mont., where Dr. Eklund serves as a medical director in the Insect- and Animal-Borne Disease Section. Dr. Bell is in the Allergy and Immunology Section, and Mr. Gerloff in the Pathology and Serology Section. Technical assistance in the study was given by Dr. G. D. Laveck, Dr. G. Silverman, Dr. Kayo Sunada, and Ione Hopkey, epidemic intelligence officers of the Communicable Disease Center, Public Health Service, Atlanta, Ga.

sponsible health officials the world over. Controlled fluoridation programs are in operation in one or more communities in the following countries: Australia, Brazil, Canada, Chile,

Colombia, Costa Rica, Egypt, England, Germany, Guatemala, Japan, the Netherlands, New Zealand, Panama, Panama Canal Zone, Peru, Philippines, Scotland, and Sweden.

Table 2. Communities using controlled fluoridation, ownership, and authorization, by size of place, December 31, 1957

| Population size of community | Number of communities in urban and rural areas ¹ | Communities using controlled fluoridation | | Ownership | | | Authorization | | | |
|------------------------------|---|---|---|-----------|---------|-------------------------|----------------------|------------|----------------------|-------------------------|
| | | Number | Percent of all communities of same size | Public | Private | Other and not specified | Governing body alone | Referendum | Utilities commission | Other and not specified |
| Total..... | 18, 548 | 1, 631 | 8. 8 | 1, 373 | 196 | 62 | 1, 344 | 86 | 58 | 143 |
| 1,000,000 and over..... | 5 | 2 | 40. 0 | 2 | | | 2 | | | |
| 500,000-999,999..... | 13 | 9 | 69. 2 | 9 | | | 8 | 1 | | |
| 250,000-499,999..... | 23 | 7 | 30. 4 | 6 | 1 | | 7 | | | |
| 100,000-249,999..... | 65 | 21 | 32. 3 | 18 | 2 | 1 | 18 | | | 3 |
| 50,000-99,999..... | 126 | 47 | 37. 3 | 40 | 6 | 1 | 41 | 3 | | 3 |
| 25,000-49,999..... | 252 | 82 | 32. 5 | 74 | 7 | 1 | 73 | 2 | 2 | 5 |
| 10,000-24,999..... | 778 | 224 | 28. 8 | 202 | 15 | 7 | 187 | 19 | 5 | 13 |
| 5,000-9,999..... | 1, 176 | 230 | 19. 6 | 194 | 31 | 5 | 192 | 13 | 4 | 21 |
| 2,500-4,999..... | 1, 846 | 270 | 14. 6 | 226 | 28 | 16 | 220 | 11 | 5 | 34 |
| 1,000-2,499..... | 4, 437 | 315 | 7. 1 | 262 | 35 | 18 | 259 | 10 | 10 | 36 |
| Under 1,000..... | 9, 827 | 2424 | 24. 3 | 157 | 46 | 1 | 181 | 9 | 4 | 10 |
| Not specified..... | | | | 183 | 25 | 12 | 156 | 18 | 28 | 18 |

¹ From U. S. Bureau of the Census: United States Census of Population: 1950, vol. I.

² Includes "Not specified."

Table 3. Changes in status of fluoridation, by year, 1945-57

| Year | Net increase in fluoridation | | | Fluoridation discontinued ¹ | | | Fluoridation reinstituted after discontinuance | | |
|------------|------------------------------|-----------------------------|-------------------------|--|-----------------------------|-------------------------|--|-----------------------------|-------------------------|
| | Number communities | Number water supply systems | Population ² | Number communities | Number water supply systems | Population ² | Number communities | Number water supply systems | Population ² |
| Total..... | 1, 631 | 870 | 33, 294, 899 | 94 | 69 | 2, 097, 955 | 13 | 13 | 289, 081 |
| 1945..... | 6 | 3 | 231, 920 | | | | | | |
| 1946..... | 6 | 5 | 100, 547 | | | | | | |
| 1947..... | 4 | 3 | 126, 281 | | | | | | |
| 1948..... | 8 | 2 | 122, 935 | | | | | | |
| 1949..... | 22 | 16 | 481, 096 | | | | | | |
| 1950..... | 50 | 33 | 515, 799 | 1 | 1 | 16, 550 | | | |
| 1951..... | 243 | 109 | 3, 369, 681 | 1 | 1 | 12, 900 | | | |
| 1952..... | 378 | 182 | 8, 604, 242 | 5 | 5 | 172, 672 | | | |
| 1953..... | 248 | 129 | 3, 528, 429 | 7 | 7 | 51, 616 | 2 | 2 | 166, 466 |
| 1954..... | 182 | 89 | 4, 127, 374 | 22 | 20 | 1, 069, 875 | 2 | 2 | 3, 934 |
| 1955..... | 153 | 97 | 3, 587, 739 | 28 | 18 | 394, 040 | 2 | 2 | 13, 972 |
| 1956..... | 221 | 97 | 6, 788, 365 | 17 | 13 | 188, 082 | 4 | 4 | 38, 369 |
| 1957..... | 110 | 105 | 1, 710, 491 | 13 | 4 | 192, 220 | 3 | 3 | 66, 340 |

¹ Total whether or not reinstituted.

² Most recently available population figures were

used regardless of the year that fluoridation was instituted.

Figure 1. Poliomyelitis, type 1 and probable type 1, among children vaccinated on or after April 17, 1955, Idaho.

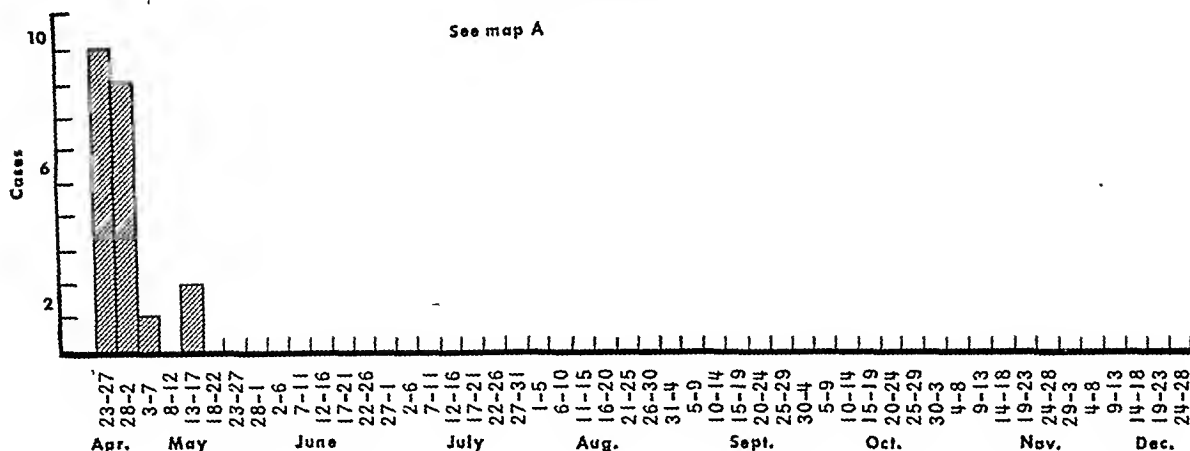
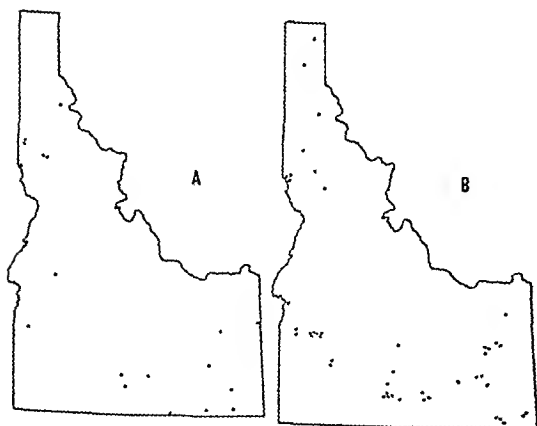
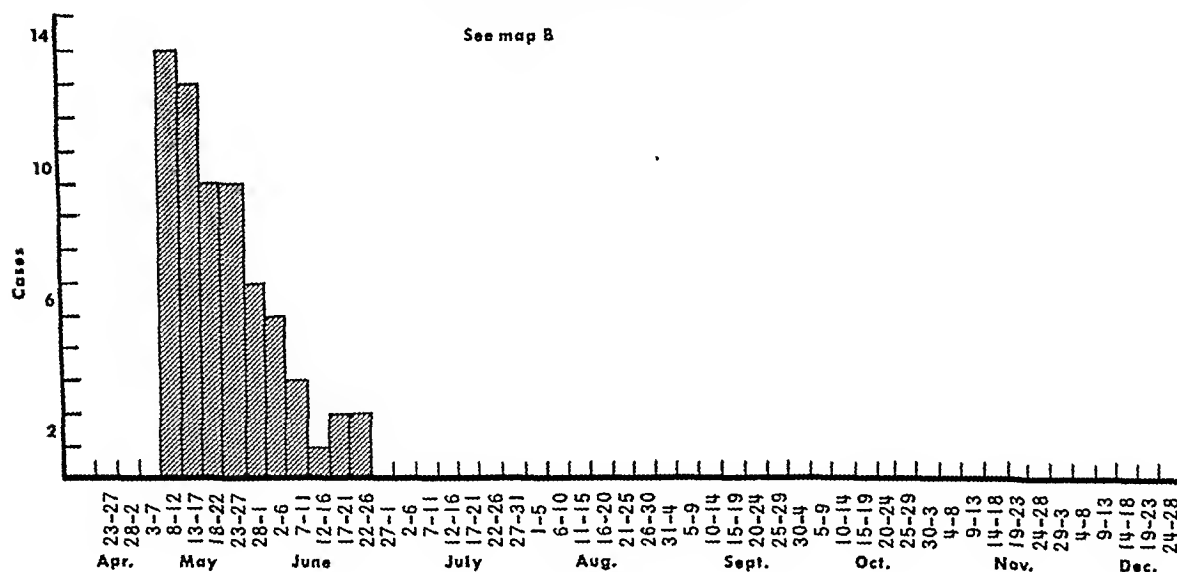


Figure 2. Poliomyelitis, type 1 and probable type 1, among contacts of children vaccinated on or after April 17, 1955, Idaho.



paralysis appears. Although no specimens were received from 25 paralytic patients, the majority of these cases were considered to be due to type 1 virus since so few type 2 and type 3 poliovirus were isolated from patients in Idaho during 1955.

Poliomyelitis occurred in 20 children who received vaccine, in 61 persons who were contacts of vaccinated children, and in 86 individuals who did not have a history of contact with vaccinated children or who had onset of illness during July or later. When onset was after July 1, 1955, the time lapse since vaccination

demic are based primarily on data concerning the incidence of poliomyelitis in the recipients of two lots of vaccine used in Idaho, the infectivity of those individuals manifesting clinical disease, and the number of secondary cases that developed.

Methods

Attempts were made to obtain clinical and epidemiological data and selected specimens from all cases of poliomyelitis reported from the time of administration of the vaccine until January 1, 1956. Whenever possible, specimens were collected from family associates of patients with onset before October 1955. Blood specimens for serologic studies also were collected from 657 children in first and second grades 6 to 8 weeks after vaccination.

All specimens were examined by standard tissue-culture techniques in which epithelial cells from the kidneys of rhesus monkeys were used. Viruses were isolated in such cultures by inoculation of suspensions of certain tissues, sputum, or feces into bottles or tubes containing sheets of cells which had been incubated at 37° C. for 7 days. Agents producing typical cytopathogenic effects were identified by neutralization tests (2) with serums which had been produced at the Rocky Mountain Laboratory and used in a portion of the study conducted by the National Foundation for Infantile Paralysis during the evaluation studies in 1954. These examinations were made in the

same laboratory that had conducted the evaluation study in Montana in 1954.

Samples of the two lots of vaccine used in Idaho were supplied by the Idaho Department of Public Health, district health department directors, practicing physicians, and, in the case of one lot, also by the manufacturer. Monkeys and special tissue-culture methods were used to detect virus in these vaccines (1).

The number of cases accepted for inclusion in the study and the criteria for their selection are given in table 1 and figures 1-7. All paralytic cases with clinical data compatible with a diagnosis of poliomyelitis have been included. In some cases, however, no specimens were submitted for examination. Nonparalytic cases were excluded unless virus was isolated from specimens collected from the patient or from a family contact.

Of 167 cases accepted as caused by type 1 poliovirus, 149 were paralytic and 18 were nonparalytic. Virus was isolated from 97 patients and from 12 family contacts. Eighteen persons from whom virus was isolated did not display evidence of paralysis, whereas 91 manifested some degree of paralysis. In 33 instances in which virus was not isolated, diagnosis was based on the presence of diagnostic titers of type 1 antibodies. In the majority of cases a rise in antibody titer was not demonstrated. These cases are included, however, since it is well known that the immunological response is already far advanced by the time

Table 1. Idaho poliomyelitis cases in 1955 probably due to type 1 virus

| Relation to vaccine | Type of case | Virus isolation | | Antibodies | | No specimens received ² | Total |
|--|--------------------|-----------------|--------|------------|------------------------------|------------------------------------|-------|
| | | Patient | Family | Rise | No rise present ¹ | | |
| Poliomyelitis in vaccinated children. | {Paralytic..... | 7 | 4 | 3 | 2 | 1 | 17 |
| | {Nonparalytic..... | 3 | 0 | 0 | 0 | 0 | 3 |
| Poliomyelitis in contacts of vaccinated children. | {Paralytic..... | 37 | 6 | 0 | 5 | 4 | 52 |
| | {Nonparalytic..... | 8 | 1 | 0 | 0 | 0 | 9 |
| Poliomyelitis with no history of contact or onset after June 30. | {Paralytic..... | 36 | 1 | 0 | 23 | 20 | 80 |
| | {Nonparalytic..... | 6 | 0 | 0 | 0 | 0 | 6 |
| Total..... | | 97 | 12 | 3 | 30 | 25 | 167 |

¹ In all cases type 1 antibodies were present either alone or in conjunction with types 2 or 3 antibodies.

² These cases are included as probable type 1 poliomyelitis since there were so few isolations of type 2 or type 3 poliovirus from cases.

So far as can be determined, about the same amount of each of the two lots was used. A diagnosis of poliomyelitis was accepted in 20 of these children (an attack rate of 62 per 100,000); 17 of them suffered paralysis (a paralysis attack rate of 53 per 100,000), and 4 died (a rate of 12 per 100,000).

Although the paralytic attack rate was high for such a widely scattered population, it was much below that observed in some outbreaks of poliomyelitis spread by natural means among populations with a previous history of poliomyelitis. In Minnesota during the summer of 1952, the paralytic attack rate among children of comparable ages was 182 per 100,000, and the death rate was 17.2 per 100,000.

In addition to clinically recognizable poliomyelitis, minor febrile illnesses occurred among children who received the vaccine. However, since vaccination was carried out at a time when respiratory illnesses were prevalent, it was difficult to relate minor illness to the use of vaccine. Approximately 20 percent of 649 vaccinated children complained of minor illnesses that occurred 1 to 2 weeks after vaccination. The illness consisted chiefly of headache, fever, general aching, and occasionally sore throat, nausea, or vomiting.

A relationship between these minor illnesses and the administration of vaccine was suggested when the antibody titers of the group with the minor illnesses were compared with those of vaccinated children who did not become ill. Since 6 percent of the children in each group did not possess antibodies to any type, they are excluded in this analysis. Children with minor febrile illnesses had a significantly greater proportion of type 2 antibody titers of 1:64 or less than the group without illness.

Type 2 antibody titers were distributed among 144 vaccinated children with minor illness and 463 children with no illness in the following manner:

| | Minor illness (percent) | No illness (percent) |
|-----------------------|-------------------------------|----------------------------|
| 1:256 or greater..... | 36 | 53 |
| 1:64 or less..... | 64 | 47 |

In the group with type 2 antibody titers of 1:256 or greater, 37 percent had an anti-

body titer of 1:256 or greater for all 3 types; 85 percent for 2 types, and 15 percent for 1 type only. The corresponding figures for the group with a type 2 antibody titer of 1:64 or less were 0 percent, 25 percent, and 50 percent. Approximately 25 percent had a high type 1 antibody titer alone, 25 percent a high type 3 antibody titer alone, and 25 percent both type 1 and type 3 antibodies in high titer. These findings suggest that among individuals who had had no previous experience with type 2 virus, infection with type 1 or type 3 virus might be associated with the symptoms of a minor febrile illness.

That type 1 virus may have been more important than type 3 virus in causing minor illness is suggested by an examination of the group of serums with type 2 antibodies in a titer of 1:256 or greater. Eighty-one percent of the group with minor illness had type 1 antibodies in a titer of 1:256 or greater, whereas 65 percent of the group with no illness possessed such titers. This difference is statistically significant ($P=.022$) and suggests that type 1 infection even in the presence of high type 2 antibody titer may at times cause minor illness. A significant difference was not found in the proportion of high type 3 antibody titers between the two groups.

Many minor illnesses apparently were not caused by infection with a poliovirus since 18 children with minor illnesses either had no antibodies or had antibodies for 1 or 2 types of virus in a titer of 1:8.

Contacts of Vaccinated Children

In 61 instances of poliomyelitis, a history of contact with vaccinated children was obtained. Children under 15 years of age and women were chiefly affected (table 2). Multiple cases occurred in some families. In 56 instances a vaccinated child, usually with no recognized illness, appeared to be the source of infection. Poliomyelitis was diagnosed in only 2 of these vaccinated children and 4 others manifested symptoms of a minor febrile illness.

The number of days from the vaccination of a child suspected to be a carrier to the onset of illness in the 61 contact cases is given in table 3. This period was less than 45 days in 54 instances. When greater than 64 days, a history

was so long that it appeared unreasonable to attribute the illness to contact with a vaccinated child.

Results

Epidemiological and clinical evidence showed a relation between the injection of poliomyelitis vaccines and the subsequent occurrence of poliomyelitis. Vaccination was begun April 17 and was practically completed within 5 days. Poliomyelitis was first reported in vaccinated children (fig. 1) in various scattered areas throughout the State (fig. 1, map A). These cases were followed by another group of cases (fig. 2, map B) limited to contacts of inoculated children. The geographic distribution of the two groups was similar. Although considerable effort was made to detect other types of poliovirus, only type 1 was isolated from these patients.

In 12 of 17 children with paralytic disease, the first evidence of paralysis was seen in the inoculated arm. In one child, the first signs, which developed on the 18th day after vaccination, were those of bulbar involvement and weakness of neck muscles. Of the 10 cases occurring within a week after administration of vaccine, 9 had onset of paralysis in the inoculated arm and 1 in a leg. In 5 of the 9, the disease progressed to bulbar poliomyelitis, and 1 child developed symptoms of severe encephalitis.

Initial involvement of an upper extremity with rapid progression to the opposite extremity and respiratory muscles was so unique clinically as to suggest that host response to poliovirus was influenced in some unusual manner. Equally striking was the lack of evidence of infection in members of patients' families when onset was less than 7 days after administration of vaccine.

Specimens were submitted from 31 family contacts (14 children) of the 7 children with onset on the fifth and sixth days after inoculation, but virus was not detected in any family contact nor was a rise in antibody titer demonstrated. Virus was first isolated from a family contact when the incubation period was 7 days. In two instances, virus was not recovered from family contacts when the incubation period was as long as 10 days. Usually,

proliferation of poliovirus takes place in the upper and lower digestive tracts before the central nervous system becomes involved, and the person is eliminating virus before symptoms recognizable as poliomyelitis occur. Furthermore, members of the family usually are found to be carrying poliovirus in their intestinal tracts by the time the initial case of poliomyelitis is diagnosed. However, in the vaccinated children in Idaho, virus apparently did not reach the intestinal tract until after the appearance of signs pointing to disturbances of the central nervous system. This observation and the fact that poliovirus was not recovered from family contacts of seven patients indicated an unnatural spread of the virus.

Several observations suggested that live poliovirus was present in the two lots of vaccine used: the time relationship of cases to the administration of vaccine, the wide geographic distribution, the frequent occurrence of initial paralysis in the inoculated arm, and the absence of evidence of poliomyelitis infection in the families of patients in whom there was a short interval between inoculation of vaccine and onset. Therefore, attempts were made to determine the amount of such virus in these lots.

By using cortisone-treated monkeys, all three types of poliovirus were isolated from each lot of vaccine. The available amount of one lot was insufficient to permit repeated attempts to isolate virus, but sufficient vaccine of the second lot was available for such tests. With this lot, the maximum number of monkeys infected with types 1, 2, and 3 poliovirus, respectively, was 4 of 10, 3 of 10, and 2 of 7. The maximum number of inoculated monkeys paralyzed in any experiment was 4 of 7.

Treatment of poliovirus with 1:4,000 formaldehyde at 37° C. for several days must produce many complex changes in the viruses, and any attempt, with present knowledge, to determine the amount of virus in such a preparation must represent only a crude estimate. Detailed findings of experiments in monkeys with these vaccine lots will be given in another report.

Reactions to the Three Viruses

Approximately 32,000 children received vaccine in the school program during April 1955.

Figure 3. Poliomyelitis, type 1, among persons with onset after July 1, 1955, or with no known contact with children vaccinated on or after April 17, 1955, Idaho.

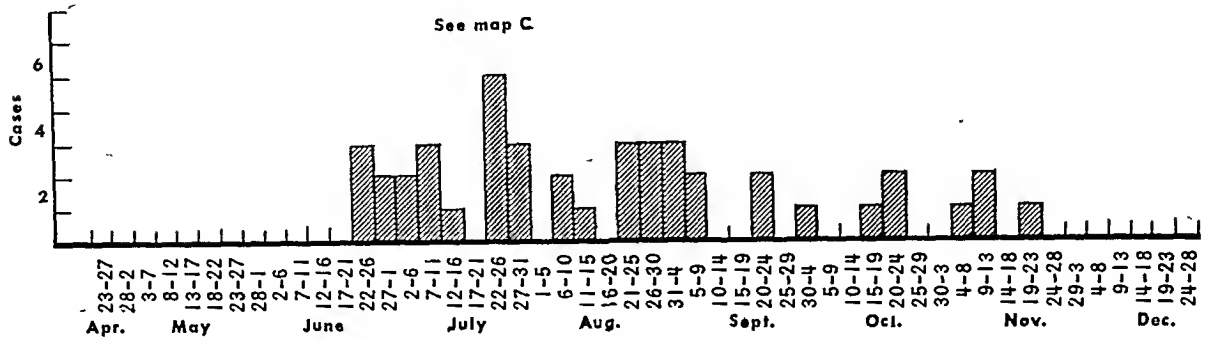


Figure 4. Paralytic poliomyelitis cases with type 1 antibodies and onset after July 1, 1955, or without contact with children vaccinated on or after April 17, 1955, Idaho.

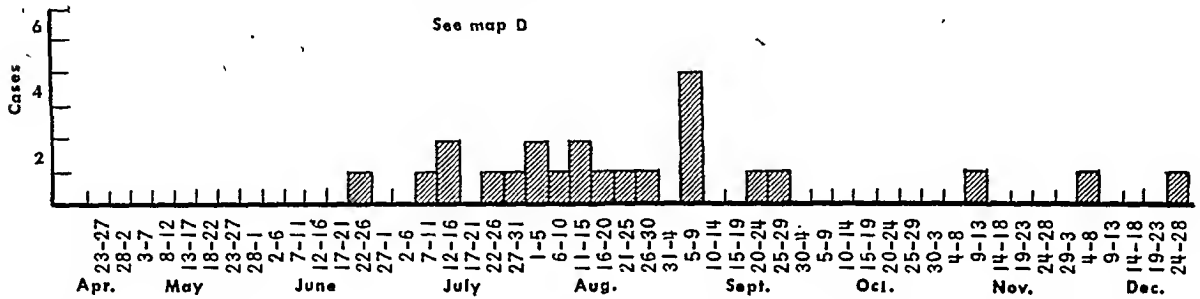
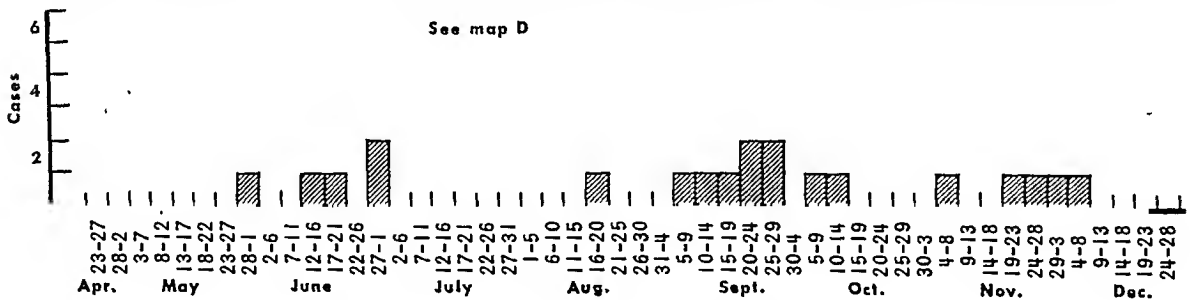


Figure 5. Paralytic poliomyelitis cases, for which no specimens were received, with onset after July 1, 1955, or having no known contact with children vaccinated on or after April 17, 1955, Idaho.



may have been exposed to poliovirus from Idaho cases.

Detection of Types 2 and 3

Type 2 poliovirus was not isolated from children receiving vaccines in Idaho or from their immediate contacts. However, type 2 virus was isolated from the family of a child whose paralytic disease began July 5 and from one patient with nonparalytic poliomyelitis with onset August 23. Serologic studies of 6 other patients with paralytic poliomyelitis showed significant antibody titers for type 2 virus. In

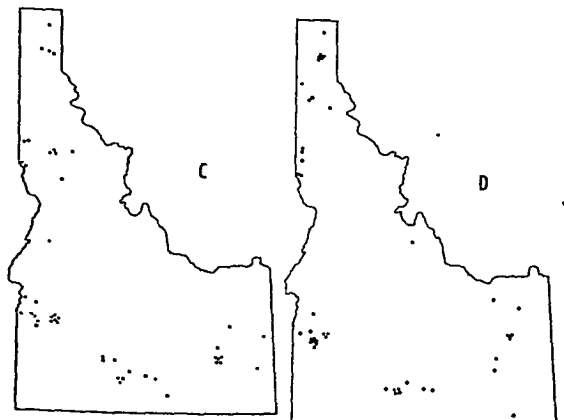


Table 2. Age and sex distribution of cases of poliomyelitis among contacts of vaccinated children, Idaho, 1955

| Age (years) | Paralytic | | Nonparalytic | |
|-------------|-----------|--------|--------------|--------|
| | Male | Female | Male | Female |
| 0-4 | 9 | 14 | 1 | 2 |
| 5-9 | 8 | 2 | 2 | 1 |
| 10-14 | 3 | 5 | 2 | 1 |
| 15-19 | 0 | 1 | 0 | 0 |
| 20-24 | 0 | 1 | 0 | 0 |
| 25-29 | 0 | 3 | 0 | 0 |
| 30-34 | 1 | 3 | 0 | 0 |
| 35-39 | 1 | 1 | 0 | 0 |
| Total | 22 | 30 | 5 | 4 |

NOTE: Three cases, in females aged 6 and 36 and a male aged 36, were fatal.

Table 3. Time of onset after vaccination of cases of poliomyelitis among contacts of vaccinated children, Idaho, 1955

| Days after vaccination | All cases | Cumulative totals | Type 1 virus from suspected source | Cumulative totals |
|------------------------|-----------|-------------------|------------------------------------|-------------------|
| 16-19 | 6 | 6 | 4 | 4 |
| 20-24 | 13 | 19 | 6 | 10 |
| 25-29 | 11 | 30 | 6 | 16 |
| 30-34 | 8 | 38 | 5 | 21 |
| 35-39 | 8 | 46 | 1 | 22 |
| 40-44 | 8 | 54 | 5 | 27 |
| 45-49 | 1 | 55 | 1 | 28 |
| 50-54 | 3 | 58 | 1 | 29 |
| 55-59 | 1 | 59 | 1 | 30 |
| 60-64 | 2 | 61 | 0 | 30 |

of association with vaccinated children was much less frequent, and a carrier other than a vaccinated child was considered to be the source. Periods as short as 16 days between administration of vaccine and onset of illness in an exposed person were observed, and in 6 instances the period was less than 20 days. Such short intervals between vaccination and onset in a contact suggest that several cycles of infection could take place within a 60-day period. It is therefore possible that some of the 61 so-called contact cases are not the result of exposure to the suspected vaccinated child but represent a cycle of infection further removed. It was impossible to designate a definite period during which contact cases could be attributed only to exposure to a vaccinated child.

Cases of poliomyelitis that occurred in Idaho later than 64 days after the vaccination program was terminated were arbitrarily classified as secondary cases. Type 1 poliovirus was isolated from 2 vaccinated children with whom poliomyelitis patients had had intimate contact, but the time of onset was 81 and 83 days, respectively, after vaccination. Whether these children were carrying virus from the time of vaccination or had become infected subsequently is uncertain.

If cases having a history of association with vaccinated children and onset within 64 days after the time of vaccination are accepted as contact cases, a carrier rate of 178 per 100,000 is obtained.

Other Associated Cases

Poliomyelitis occurred in 86 persons whose contact with a vaccinated child did not appear to be the source of infection but in whom type 1 poliovirus was shown to be the cause, or most probable cause, of illness. As shown in figures 3-5 and table 4, the disease occurred in some of these at the same time as it did in those having intimate contact with vaccinated children. Usually, however, onset was so long after the time of vaccination that poliomyelitis due to exposure to a vaccinated child did not appear probable.

As noted in figures 3-5, 19 cases occurred during each of the three 30-day periods from July 1 to September 28, but the number then fell to approximately 7 during the 30-day periods between September 29 and December 28. Probably these cases represent at least the third cycle of infection following the use of vaccine, since they began to appear immediately following the occurrence of known contact cases and occurred in areas where vaccinated children developed poliomyelitis.

Twelve poliomyelitis patients, 11 paralytic and 1 nonparalytic, were admitted to Idaho hospitals from adjoining Malheur County, Ore. Type 1 poliovirus was isolated from nine patients. Onset of the first case was August 24; of the last, October 28. An adjacent Idaho area, in which several cases of poliomyelitis occurred, is a trading center for the Oregon county. It appears possible that these patients

cent of these children, a limited spread of type 1 virus during the summer and fall of 1955 is indicated.

The antibody titers of blood specimens from children who had received vaccine in 1955 and from those who had served as controls in vaccine studies in Idaho in 1954 were compared for each of the three types of poliovirus. Although titrations of the 1954 serums were performed in the poliomyelitis evaluation laboratory at the University of Oregon Medical Col-

lege, Portland, the data are considered to be roughly comparable. More children in the 1955 group had titers of 1:1,024 or higher against each of the viruses, whereas a lower proportion had a serum titer of less than 1:8 (table 5). Since serums of approximately 30 percent of the children vaccinated in 1955 had no appreciable titer against type 1 and type 3 viruses, these children apparently were not infected by the amount of viruses present in the vaccines (table 6). Antibody responses to three doses of vac-

Figure 6. Poliomyelitis, type 2, after vaccinations beginning April 17, 1955, Idaho.

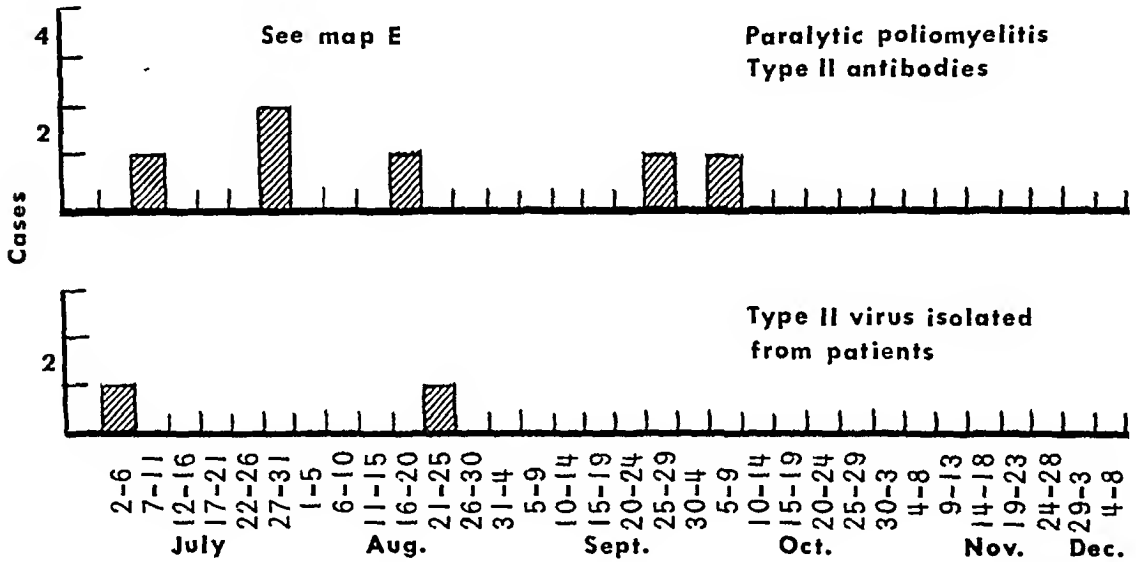


Figure 7. Poliomyelitis, type 3, after vaccinations beginning April 17, 1955, Idaho.

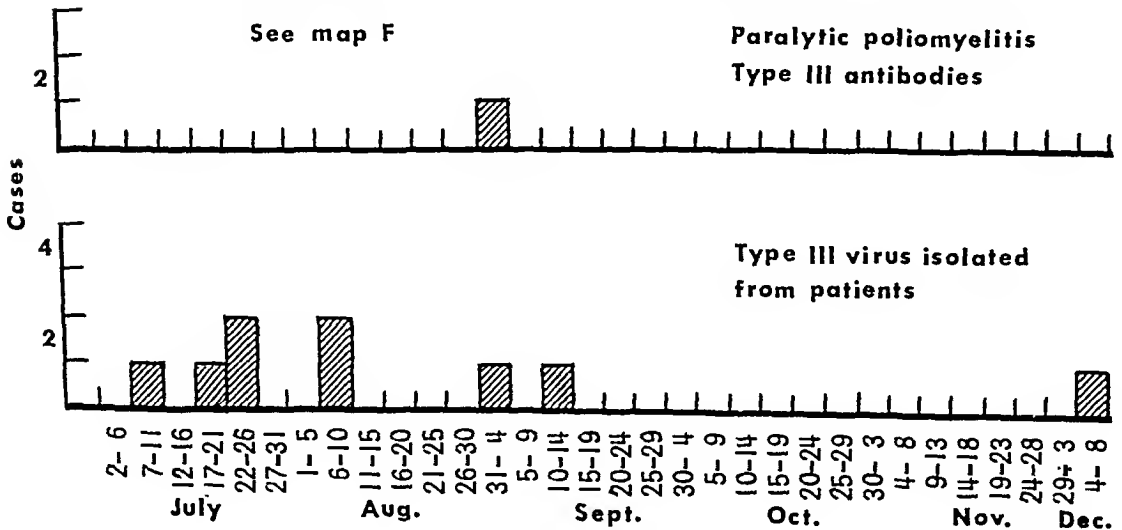


Table 4. Age and sex distribution of poliomyelitis cases unassociated with vaccinated children, Idaho, 1955

| Age | Type 1 virus isolated | | | | Type 1 antibodies, paralytic | | No specimen, paralytic | | Total |
|------------|-----------------------|--------|--------------|--------|---------------------------------|--------|---------------------------|--------|-------|
| | Paralytic | | Nonparalytic | | | | | | |
| | Male | Female | Male | Female | Male | Female | Male | Female | |
| 0-4----- | 10 | 8 | 0 | 2 | 1 | 0 | 5 | 0 | 26 |
| 5-9----- | 6 | 5 | 1 | 1 | 1 | 2 | 2 | 1 | 19 |
| 10-14----- | 1 | 2 | 1 | 1 | 0 | 2 | 2 | 1 | 10 |
| 15-19----- | 2 | 0 | 0 | 0 | 3 | 1 | 1 | 0 | 7 |
| 20-24----- | 0 | 2 | 0 | 0 | 0 | 3 | 0 | 1 | 6 |
| 25-29----- | 1 | 0 | 0 | 0 | 3 | 2 | 1 | 3 | 10 |
| 30-34----- | 0 | 0 | 0 | 0 | 2 | 2 | 1 | 0 | 5 |
| 35-39----- | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| 40-44----- | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 45-49----- | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 2 |
| Total----- | 20 | 17 | 2 | 4 | 10 | 13 | 13 | 7 | 86 |

3 of these persons, the onset occurred during July (fifth, seventh, and eighth), 1 during August, 1 during September, and 1 during October. Three patients (2 male and 1 female) were in the age group 0 to 9, 1 patient (female) in the age group 10 to 19, and 4 patients (1 male and 3 females) in the age group 20 to 24. It was not possible to establish that the vaccine was the source of infection in these instances (fig. 6).

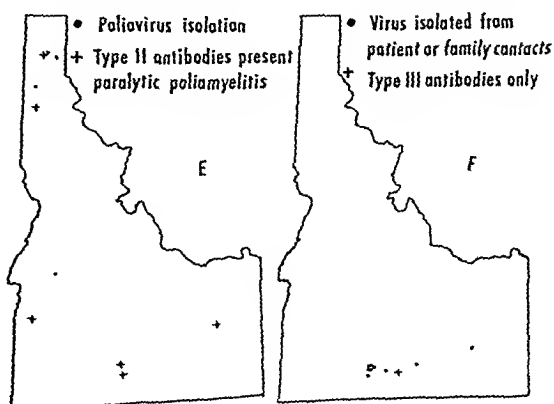
Although clinical poliomyelitis due to type 3 virus was not demonstrated in vaccinated children or in their intimate contacts, the possibility that minor illnesses resulted from injection of this virus cannot be excluded. A high neutralizing antibody titer for type 3 poliovirus and low or no neutralizing titers for the other two types of poliovirus were obtained from blood specimens of 21 children who gave a history of minor illness 6 to 8 weeks after vaccination.

Scattered cases of poliomyelitis caused by type 3 virus occurred in Idaho late in the summer. On nine occasions, diagnosis was established by isolation of virus either from patients or from members of the patient's family. In addition, only type 3 antibody was found in the serum of one paralytic patient from whom virus was not isolated. In this group of 10 patients, 4 had onset in July, 4 in August, 1 in September, and 1 in December (figs. 6 and 7). The earliest date of onset was July 9.

Five patients (3 male and 2 female) were in the age group 0 to 9, 3 (1 male and 2 female) in the age group 10 to 19, and 2 males in the age group 25 to 34. The sex and age distribution, the time of onset, and the geographic distribution did not suggest a connection with use of the vaccine.

Antibody Levels

During the vaccine study conducted in late 1955 and early 1956, blood specimens were obtained from 480 nonvaccinated individuals, chiefly children, and the levels of antibodies against specific types of poliovirus were determined at the Rocky Mountain Laboratory (table 5). Since the antibody level for type 1 poliovirus was less than 1:8 in 53.5 percent and was 1:1,024 or greater in only 1.2 per-



immune status of a population and to season of the year is inadequate to explain the epidemic occurrence of poliomyelitis.

Strangely, viable types 2 and 3 polioviruses present in the vaccine did not cause disease in vaccinated children or spread to their contacts. This could be due to a lack of virulence of these viruses for human beings when given intramuscularly or to interference between strains when administered simultaneously to susceptible individuals. The presence in vaccinated children of high antibody titers for types 2 and 3 polioviruses, however, suggests that these strains proliferated. The absence of central nervous system disease due to infection with type 2 and type 3 strains demonstrates the inability of these strains to invade the central nervous system following intramuscular inoculation. In monkeys, these strains, particularly type 3, showed little ability to produce viremia or to proliferate in peripheral tissues, characteristics which may be related to absence of disease in vaccinated children. The type 1 strain, which was definitely virulent for children, frequently was isolated from blood and peripheral tissues of monkeys. A type 1 strain without these characteristics appears desirable for use in a vaccine.

Summary

In Idaho, with a population of approximately 600,000, two lots of poliomyelitis vaccine were used during April 1955 to vaccinate 32,000 children in the first and second grades. All three types of poliovirus were isolated from

these lots of vaccine. Poliomyelitis due to type 1 virus occurred in 20 vaccinated children and in 61 of their contacts. In addition, 86 persons developed poliomyelitis from possible contact with these two groups. Thus, 167 cases were associated with the use of these two lots of vaccine. Poliomyelitis due to type 2 or type 3 viruses was infrequent, and evidence relating infections with these types to the vaccine used was not obtained. The absence of a severe outbreak of poliomyelitis due to type 1 virus is noteworthy in view of the wide dissemination of a virulent strain of type 1 poliovirus throughout the State. Since the immunity of the population was rather low as indicated by the previous history of poliomyelitis and by the 1954 vaccine evaluation study, a more severe outbreak would have been expected. Factors in addition to virulence of a poliovirus strain and immune status of a population are yet to be discovered before the genesis of poliomyelitis outbreaks can be explained adequately.

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U. S. Medical Supply Stocks Surveyed

A survey of the Nation's supply of medical items essential to survival following nuclear attack is being conducted by the Public Health Service. With the cooperation of the pharmaceutical industry, more than 700 wholesale drug houses, surgical supply firms, and chain drugstore warehouses will be covered in the survey, which is part of a program set up by the Office of Defense Mobilization. Also participating in this program are the Business and Defense Services Administration of the Department of Commerce, the Federal Civil Defense Administration, and the Department of Defense.

Table 5. Comparison of antibody titers of serums from children vaccinated in Idaho, 1955, with serums from nonvaccinated children

| Category | Percentage of specimens with indicated reciprocals of titer | | | | | | | |
|---------------------------------|---|----|----|-------|----|-----|-------------------|---------------|
| | <8 | 8 | 16 | 32 | 64 | 256 | Total 8 to 256 | 1,024 or > |
| <i>Type 1 virus</i> | | | | | | | | |
| Vaccinated 1955 ¹ | 27 | 3 | 3 | 5 | 8 | 14 | 33 | 40 |
| Nonvaccinated 1955 ² | 54 | 3 | 3 | 7 | 19 | 13 | 45 | 1 |
| Nonvaccinated 1954 ³ | 46 | 4 | 9 | ----- | 19 | 15 | 47 | 7 |
| <i>Type 2 virus</i> | | | | | | | | |
| Vaccinated 1955 ¹ | 13 | 10 | 8 | 9 | 14 | 15 | 56 | 31 |
| Nonvaccinated 1955 ² | 65 | 2 | 2 | 3 | 8 | 12 | 27 | 8 |
| Nonvaccinated 1954 ³ | 59 | 2 | 6 | ----- | 13 | 12 | 33 | 8 |
| <i>Type 3 virus</i> | | | | | | | | |
| Vaccinated 1955 ¹ | 32 | 6 | 5 | 4 | 3 | 9 | 27 | 41 |
| Nonvaccinated 1955 ² | 48 | 2 | 5 | 7 | 20 | 13 | 47 | 5 |
| Nonvaccinated 1954 ³ | 54 | 1 | 13 | ----- | 20 | 8 | 42 | 4 |

¹ 649 children vaccinated April 17-22, 1955; serums obtained June 2-14, 1955.

² Serums obtained from 480 children during late fall and winter 1955-56.

³ Serums obtained from 281 children, November 1954, in connection with the 1954 NFIP poliomyelitis evaluation study.

cine with "good" antigenicities reported in the 1954 study (3) and of vaccine used in Idaho in 1955 are compared in table 6.

Antibody distribution for children vaccinated in 1954 is well illustrated by the results obtained through neutralization of type 1 po-

Table 6. Antibody levels after 3 injections of "good" vaccine lots in the 1954 poliomyelitis evaluation study of NFIP compared with those developing after a single injection of vaccine containing live virus

| | Total number | Percent with titers 8 or < | Percent with titers 16 to 256 | Percent with titers 1,024 or > |
|---------------|-----------------|-------------------------------------|--|---|
| <i>Type 1</i> | | | | |
| 1954----- | 1, 250 | 14 | 51 | 35 |
| 1955----- | 657 | 31 | 29 | 40 |
| <i>Type 2</i> | | | | |
| 1954----- | 1, 250 | 7 | 60 | 33 |
| 1955----- | 657 | 23 | 46 | 31 |
| <i>Type 3</i> | | | | |
| 1954----- | 1, 250 | 10 | 58 | 32 |
| 1955----- | 657 | 38 | 21 | 41 |

liovirus (table 6). The discrepancy between the proportion of children having intermediate titers in the group vaccinated in 1955 and the proportion in the group vaccinated in 1954 is what would be expected from administration of live virus. Individuals either developed infection and as a result produced antibodies in high titer or failed to become infected and consequently produced no antibodies.

Discussion

It is rather surprising that the intramuscular inoculation of a virulent strain of type 1 poliovirus, which was capable of spreading from person to person, did not give rise to a more severe epidemic. The population had a large number of susceptible individuals, as indicated by antibody studies before and after administration of the vaccine and by the past history of poliomyelitis in the area. Vaccine was given in the spring when the weather was cold, but type 1 virus was still present in the population later in the summer. Yet an increase in the incidence of poliomyelitis did not occur. Consequently, one must conclude that a simple relationship of virulence of virus to

Committee Members

Members of the Committee for Review and Evaluation of Research and Development Positions are Dr. Frederick J. Brady, program officer, Bureau of State Services, chairman; Dr. George H. Bradley, assistant chief, Communicable Disease Center; Dr. Keith H. Lewis, chief, Milk and Food Research Program, Robert A. Taft Sanitary Engineering Center; and Dr. Herbert E. Stokinger, chief toxicologist, Occupational Health Branch, Division of

Special Health Services. H. N. Meng, Division of Personnel, Office of the Surgeon General, serves as the committee's technical adviser; Lambert G. Longen, Executive Office, and Harold F. Eisele, Program Office, Bureau of State Services, are its staff assistants. Dr. John C. Cutler served as chairman prior to his transfer to the National Institutes of Health as assistant director, National Institute of Allergy and Infectious Diseases.

their work reviewed comprehensively by members of their own scientific discipline.

The results of the Survey of Attitudes of Scientists and Engineers in Government and Industry, conducted by the Committee on Engineers and Scientists for Federal Government Programs, may reflect significantly the Bureau's reviews. The survey found that 65 percent of the scientists in the Bureau were satisfied with their job classification, as compared with 52 percent of those queried

throughout the Federal Government. Fifty percent of the Bureau scientists, and only 37 percent of the entire Government, believed their positions offered sufficient opportunity for salary advancement.

The Bureau's system has strengthened its scientific research and development, provided program administrators with classification and utilization reviews suited to their organization, and assured the scientist of a technically broad appraisal of his job.

Research Grant for National Library of Medicine

The Council of Library Resources has granted the National Library of Medicine \$73,800 to study methods of improving bibliographic services through the use of mechanical equipment.

The primary aim of this research project will be to develop improved methods for the rapid and efficient publication of comprehensive periodical literature indexes in broad subject fields.

To accomplish this goal, new composition techniques based on an integration of photographic and data-processing equipment will be investigated.

If the project is successful, the resultant changes in format and manuscript preparation will be adopted with the 1960 issues of the *Current List of Medical Literature*.

Appraising Scientists And Their Jobs

RICHARD W. BUNCH

IN THE INTEREST of properly appraising the scientists in its employ, the Bureau of State Services, Public Health Service, has devised a system for reviewing research and development positions.

Anyone who has had experience in grading research positions has faced the problem of finding criteria for measuring the quality of performance, a factor which materially affects the grade of the position.

The usual standards of job evaluation and measures of workload and accomplishment may be difficult to apply. The number of the scientist's publications may be quite misleading because years of preliminary unpublished trials may precede consequential results. The scientist is inclined to believe that a position classifier not trained in his specialty cannot satisfactorily evaluate his job. These considerations caused the Bureau of State Services to seek a better method of classifying scientists.

The Bureau uses scientists of many professions and disciplines in helping States and communities prevent and control disease and maintain health. Its programs include control of venereal disease, tuberculosis, and other communicable diseases; heart disease; chronic illness and aging; dental public health; air pollution control; water supply and water pollution control; milk and food sanitation; radiological health; and international health. Often its scientific personnel, by the nature of their jobs, are isolated from colleagues or supervisors trained in the same disciplines.

To enhance the job status of these men and women, the Bureau in 1955 formed the Committee for Review and Evaluation of Research and Development Positions to appraise, within the framework of civil service regulations, individual scientists and their achievements. The

committee's reviews, repeated at intervals of approximately 2 years, cover all scientists in grades GS-11 and above in research and development positions.

Basic to the committee's evaluations is the concept that, in determining the proper grade and salary of such positions, it is difficult to separate the job and the incumbent. The scientist's background, experience, professional capabilities, and achievements cannot be disregarded. In research and development work, the individual tends to create the level of his assignment by the quality of his research contributions. The grading of such positions must necessarily be related to the qualifications the individual brings to the position as well as to the nature of his duties and responsibilities.

A scientist's peers, who are themselves leaders in a field, can best evaluate his work, the committee believed. Consequently, panels of 3 or 4 peers from Public Health Service bureaus, other Government agencies, universities, and private industry have been appointed to work with the committee. The committee, with the help of these panels, applies standards used in governmental and nongovernmental positions to classify salaries and recognize scientific achievement.

Within the Bureau, the committee and its various panels of specialists have reviewed approximately 150 positions, covering all civil service scientists engaged in research and development activities. These included 32 in bacteriology-microbiology, 24 in other biological sciences, 37 in chemistry, 39 in statistics, 12 in behavioral sciences, and 6 exempt positions as provided in the Public Health Service Act, section 208 (g).

In addition to recommendations on the pay levels and classification of individual scientists, these reviews have yielded valuable counsel on better utilization of scientific skills and the need for special training and changes in assignment to round out professional experience.

The committee's recommendations and supporting statements from the panels of professional peers provide the Bureau and division chiefs with an adequate evaluation of the contributions of staff members whose professional training may have differed from their supervisor's. And for the first time, scientists have

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Many technical and practical problems are encountered when a rigorous evaluative study is attempted. This paper will not discuss them. Instead, we shall consider how certain decisions about the research design and how certain problems that arise in executing the research within an operating program restrict the interpretation of the findings. Using a recent effort to evaluate the effectiveness of a rehabilitation program for posthospitalized mental patients as an illustration, we shall examine in particular the limitations imposed on the definition of what is being evaluated.

The Altro Project

The specific rehabilitation program that was subject to our evaluative investigation was that of the Altro Health and Rehabilitation Services, Inc., located in the Bronx, N. Y.

For more than 40 years Altro has operated a sheltered workshop for tuberculous patients, and it has served cardiac patients for more than 6 years (11, 12). After extended periods of hospitalization, these patients come to the Altro workshop where they remain, on the average, about a year before they graduate. They work in a factory environment but with work pressures adjusted to their health rather than to the demands of production. The workshop is, indeed, a modern garment factory manufacturing uniforms for nurses and hospital gowns that are sold by a sales force on the competitive market. Patients are paid union scale wages at piece rates for goods produced. They are subsidized when necessary to permit them to remain in the rehabilitation program.

The patients are under close but unobtrusive medical supervision; they are provided with periodic health examinations and continuous convalescent treatment when required. All patients put in a full day, but the actual time each works is determined by his particular needs. Work and rest periods alternate in recognition of disability and the development of work tolerance. Supervisors in the factory and instructors in the office-training program are practiced in dealing with the special problems of posthospitalized patients and many are themselves graduates of Altro. Each patient is assigned a caseworker and other social services

are available such as vocational counseling, job placement, and educational assistance.

The program is intended to harden the patient so that his transition from hospital to demands of normal living will not be so abrupt as to threaten his recovery and precipitate rehospitalization. By letting patients test the limits of their capacities in its workshop, Altro hopes that its clients will learn to function independently in the community.

From retrospective studies there is evidence that Altro makes an effective contribution to the rehabilitation of tuberculous and heart patients (13, 14).

With the need of tuberculous patients for rehabilitation services decreasing, and with the cardiac program well established, Altro turned its interest to the inclusion of psychiatric patients. In 1953 Altro began a year of experimental collaboration with Hillside Hospital, a private mental hospital in New York City (15). Ten patients were referred to Altro by Hillside, and seven participated in the workshop. With this experience added to the years of serving other types of patients, Altro felt ready to extend its services tentatively to certain types of hospitalized mental patients from the more heterogeneous populations of State hospitals (16). It did so with the widespread encouragement of psychiatrists and other professional persons concerned with mental health. Indeed, throughout discussions of potential sources for the limited number of patients that Altro felt able to serve, the director of Altro was repeatedly assured that this sort of rehabilitation service was greatly needed in the psychiatric field and that there would be strong demand for it.

With such assurances, arrangements were concluded with the New York State Department of Mental Hygiene for exploring the value of this service to patients of its Bronx aftercare clinic. Financial support was obtained to extend Altro's program, and the Russell Sage Foundation gave financial assistance for an evaluation of this effort. In accepting such assistance, Altro committed itself to a control-group design as an evaluative requirement. The patients were to be assigned at random to the experimental and control groups. The research question could therefore be stated at the outset as fol-

Study of the Altro Health and Rehabilitation Services' program for rehabilitation of posthospitalized mental patients illustrates some requirements for evaluative research in mental health. Limitations imposed by control group designs and selective biases arising from the operation of the program are taken into account.

Evaluating a Rehabilitation Program for Post-Hospital Mental Patients

HENRY J. MEYER, Ph.D., and EDGAR F. BORGATTA, Ph.D.

INTEREST in rehabilitation services for posthospitalized psychiatric patients has been stimulated by an increase in release rates from hospitals, following introduction of drug therapies, and by wider recognition that family, employment, and other social conditions appear to affect successful adjustment in the community (1-4). This interest may be thought of as a counterpart to the even greater attention paid to preventive programs (5).

Whether programs are directed toward prevention or rehabilitation, claims for their efficacy inevitably raise the question of evaluation. In the interest of efficiency as well as economy, sound assessment of effectiveness is obligatory for those who promote these programs as contributions to mental health. The need for evaluative research is widely acknowledged (6). But evaluative research on a service program in the field of mental health is, as

Clausen has said, "so appealing and yet so hazardous" (7).

Because of the pressing need to evaluate programs in which much time, effort, and money have been invested, most studies fall short of the rigor expected of scientific research. This is understandable in view of the difficulties of evaluating complex, changing, and often experimental efforts. Studies of the staff's or clients' satisfaction with a program, subjective judgments about progress or change, case studies to illustrate success, and similar reports may contribute useful knowledge about the operations of a program and may be valid sources of insight and understanding. But it is of no help to the orderly development of scientific knowledge to accept these studies as demonstrations of success or failure when it is possible to attempt more rigorous research. The state of our ignorance and the means of overcoming it should be accepted so that we may proceed slowly, and often painfully, to gain secure knowledge of what is being accomplished. The conclusion that this is the way of progress in evaluative research has been recognized not only for programs directly concerned with mental health but also for related fields, such as social case-work, prevention of delinquency, and education of parents (8-10).

Dr. Meyer is professor of sociology and social work at the University of Michigan, Ann Arbor. Dr. Borgatta is associate social psychologist at the Russell Sage Foundation and adjunct professor of sociology at New York University. This paper was presented in somewhat different form at the annual meeting of the American Sociological Society in Washington, D. C., on August 27, 1957.

we want to know what Altro achieves only through its treatment services, we would have to compare those who went through the program with patients who might have gone through if they had had the opportunity. Still undefined would be which of the many things included in the rehabilitation program produced given results for experimental cases as compared with control cases.

It is conceivable that the treatment experiences for the experimental group could be recorded in detail at all points after their selection. In this manner specific treatment efforts might be related to variations in the degree of success or failure observed after treatment. It would be necessary, however, to have similar detailed knowledge of the experiences of the comparison group. Some of the features of the rehabilitation program at Altro, sympathetic work supervision, for example, might well be present in the experiences of patients in the control group.

Similarly, the effectiveness of any one of the specific kinds of treatment services could be stated only if the method of assignment to receive different services was governed by a random rather than a selective procedure.

For this particular evaluation the population was defined as patients who accepted the invitation to enter the Altro program. Among such, the treatment and comparison groups were selected at random and our generalizations must apply only to this population. The point here is that the design limited generalization to a segment of the population that might provide the answer to the question: Is Altro effective in rehabilitating posthospitalized mental patients?

Defining Treatable Patients

Restrictions from another side limit generalization in evaluative research. Any given treatment or service program assumes a part of the answer to the question of its own effectiveness by directing itself to predetermined categories of patients. Thus it says, in effect, we will (or can) work better with one type of client than with another.

The "community function" of the agency draws the broadest boundaries; for example, to

serve the aged, the adolescent, the tuberculous, or the ex-mental hospital patient. Within these boundaries further criteria of inclusion or exclusion are explicitly or implicitly accepted. Adjectives modify the clientele: healthy aged, female adolescents, arrested tuberculosis cases, or ex-hospitalized schizophrenic patients, are acceptable for treatment.

Still further exclusions are made by defining the type of services available; for example, healthy aged who need a home, adolescent girls who are going to have out-of-wedlock babies, arrested tuberculosis patients who can be expected to return to work or housekeeping, or ex-hospitalized schizophrenic patients who need rehabilitation.

Finally, among those potential clients for whom the services are intended, agencies develop conceptions of clients who can be best served by their skills. The rationale for these conceptions rests on estimates of competence in practice based on professional training and experience. It accepts, indeed, an evaluative conclusion before the question of evaluation is posed for research.

Thus the question asked of evaluative research might be restated as follows: How successful are we with those clients we want to serve and think we can help? This is an entirely legitimate question but it is much more restricted than the question: How effective is our program?

Research operations that come to grips with this restriction must seek explicit criteria to define the subject population from the viewpoint of the service agency. In the Altro project, staff and consultants formulated these general criteria: Bronx residents, 20-40 years of age, admitted only once to a mental hospital for 3-24 months, having formal psychiatric diagnosis of dementia praecox. In addition, to protect the going workshop program and in the interests of the patient, clinical criteria were to be applied in interviews by a psychiatrist to eliminate those who were "too sick" (revealing disturbing or dangerous psychotic symptoms, physically incapacitated, addicted to drugs), those who were "too well" (not in need of rehabilitation), and those having "alternative plans" (employment, household duties). Cases that survived all these criteria would be avail-

lows: Given matched groups of patients, will those who receive Altro services show greater progress, by some criterion of successful rehabilitation, than those who do not receive such services?

Altro planned to accept about 80 psychiatric patients during the 2 years of the study period. These patients would at any given time constitute about 20 percent of the normal caseload of approximately 200 patients at the workshop.

Defining Experimental and Control Groups

A service program, such as Altro's, is in general oriented to practice rather than to scientific research, and the canons of scientific methodology frequently appear to contradict the canons of practice. Altro's acceptance of a control-group design was therefore a bold step toward rigorous evaluation. As decisions were made to further this design, however, it was necessary to make some of the implications explicit.

With a control-group design one is in a position to say whether or not a program makes a difference to some population, on the basis of some criterion, such as return to the hospital. A program of rehabilitation includes many factors that might affect the client's welfare. The Altro program offers medical care, casework, vocational training, and other services as well as its distinctive workshop. Unless these factors can be specifically identified so that their counterparts can be examined in the experience of persons in the control group, our conclusion must be framed in general terms. We could say that Altro's patients in general fare better than non-Altro patients. From the standpoint of the community, this might be called the potential impact of Altro. It leads to statements about what the consequences would be if all patients were provided the same services as Altro's patients.

This kind of conclusion is very useful. It would require, however, further qualification in terms of the expressly defined population of patients to which it could be applied. If experimental and control groups were drawn from the population of all ex-hospitalized patients, our conclusion would mean one thing. If they were drawn from a population of patients limited by

interest in Altro, by stated characteristics, or by other definitions, our conclusion would thereby be restricted. This may be illustrated by considering a number of possible definitions of the subject population that might (ignoring practical considerations) be applied in this study.

Patients who were released from mental hospitals could respond in at least the following four ways to invitations to enter the Altro program:

1. They could be uninterested and decline the invitation.
2. They could be interested, explore the possibility, and decline to enter.
3. They could be interested, explore the possibility, enter, and withdraw at some stage in the program before it had been completed.
4. They could be interested, explore the possibility, enter, and graduate.

Furthermore, patients responding at any of these levels would constitute a population all of whom had had at least some information about Altro, ranging from mere knowledge of its existence to full participation in it. Therefore a no-contact category is logically required. Of such, at least two subcategories must be recognized since the distinction between them might be relevant to rehabilitation: (a) those ignorant of Altro altogether, and (b) those who know of Altro's existence but have had no further contact with it. Knowing about Altro could result in such meaningful reactions as: Is Altro the kind of place for people like me? Is it good or bad that people want to help former patients?

Similarly, each of the successive levels of contact noted above might reasonably be expected to have some effect on the patient's rehabilitation. Would the patient view an invitation to Altro as supportive or threatening? If a patient declined an invitation to Altro would he be punished or rewarded? And so on.

Generalization would be limited to that level selected as the population from which experimental and control groups were chosen at random. If a no-contact comparison group were used, statements about the impact of knowledge of Altro plus subsequent contact would be permissible. If the population were defined as patients informed about Altro but with various levels of contact with it, generalization would be appropriate only at the specified level. If

control samples from those patients who actually enter the workshop and who are therefore subject to the rehabilitation program, we could evaluate the program. Because this would require arbitrary denial of service to some of those who have already accepted it, such a design is difficult to execute even for the most willing operating agency. A more feasible alternative would be to require the agency to extend maximum effort to see that patients selected for the experimental group were brought into the program.

Defining Successful Rehabilitation

Whatever the experimental design, the definition of what constitutes successful treatment poses additional issues. These will not be considered in detail in this paper. Criteria for successful rehabilitation can range from "objective" measurements, such as permanent avoidance of readmission to a hospital, to clinical judgments about the level of mental health of the patients, with various indicators of adjustment in between.

Whatever criteria are used, the value of a study is enhanced if the experimental design requires impartial application of the criteria to experimental and control groups alike. It will not, to be sure, support general statements about effectiveness of a program unless a fairly inclusive range of criteria is offered. It is at this point that some theory of what the rehabilitation program is supposed to do for patients becomes indispensable. Theory about treatment of the mentally ill is in a state of flux today. Therefore evaluation studies should, in our opinion, always include indicators such as rate of readmission along with other criteria. Attention should be given as well to the duration of whatever effects are observed.

In the Altro study, hospital status 1 year after release is the primary criterion but, in addition, employment adjustment, presence and type of psychiatric care, and a judgment of the patient's current competence for managing are included in the followup interview. Brief before-and-after attitude tests have also been used.

Conclusion

If a research plan as promising as that reported here encounters such serious obstacles, is

it futile to attempt rigorous evaluative research that is so badly needed? We think not. Several kinds of contributions can be made, and their importance will be directly related to the rigor with which the evaluation was planned and executed.

In the first place, a description of the selective process is of crucial importance to the interpretation of evaluation studies, and this is seldom reported in the literature of mental health. Second, analysis of the results of well-designed evaluation studies, even when they fall short of full success, will contribute to an understanding of the service program with greater certainty and more appropriate caution. Furthermore, each carefully conceived effort to meet the requirements of valid evaluation will provide experience to enhance the next attempt.

We sought to make explicit some of the inherent requirements of evaluative research. The difficulties encountered in the Altro project should not discourage evaluative research; their identification is the first step toward overcoming them. But this report should encourage modesty in making claims for service programs in mental health. As more certain knowledge accumulates, we may expect these programs to become more firmly based and demonstrably more effective.

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able to Altro and hence the subjects of the evaluative research.

A conflict between voluntary and authoritarian programs of treatment becomes pertinent at this point. Most private agencies, Altro included, adopt a treatment philosophy that expects the client to "accept" or "want" help in contrast to a treatment philosophy that asserts what the patient "should" or "must" do or have done to him. For example, State mental hospitals get "permission" to administer shock therapies; private agencies seek "cooperation" and "acceptance" of casework by their clients. Without prejudging the success of these approaches, we point out that the compromise of these conflicting philosophies of professional responsibility injects an additional selective definition of the subject population in evaluative research. We can describe some of the effects of this selective process on the Altro project.

Of the total caseload of ex-mental hospital patients at the Bronx after-care clinic, about 18 percent qualified under the general criteria enumerated above. Of these, about 28 percent survived the clinical screening, constituting only about 5 percent of the general population of posthospitalized mental patients. This is the point at which treatment and control groups were selected and evaluation could be said to apply only to these patients. Analysis of these groups, selected at random, indicates that the two samples do not differ significantly at the time of assignment with respect to any known characteristics.

The pool of patients from which both experimental and control groups were drawn does differ from the population of ex-hospitalized patients meeting the general criteria. The clinical screening process tended to anticipate the kind of clients the agency might favor. Specifically, the group of "available" patients includes a disproportionate number of single, white, better educated persons who have a higher occupational status, and who live with their parental families.

Because the selection just described occurs before experimental and comparison groups are chosen, it may be said to be controlled, if follow-up and before and after measurements are applied to these samples. However, it cannot be

assumed that the process of selective bias will cease at this point.

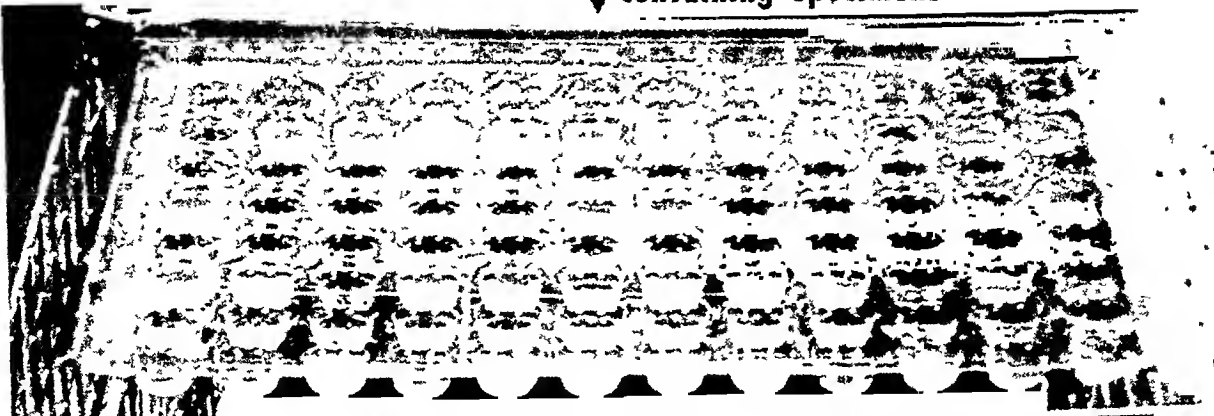
The professional approach of those providing service tends to select patients of unknown characteristics among those available to receive treatment. The logic of evaluative research would require, without compromise, that those designated for treatment be given treatment; the values of social casework and rehabilitative practice tend to assume that treatment should only be given to those who would accept it. Practitioners often argue that they can be effective only with such patients although this is one of the key questions that evaluative research is supposed to answer.

Of the pool of patients available as experimental cases for the Altro project, about a third had no contact whatsoever with Altro, another third had limited contact with members of the staff, and the final third actually entered the workshop. If the latter group is considered to be the only one composed of cases subject to the rehabilitation program, it constitutes a selected population for which the principles of selection might be explored retroactively. If the individuals in that group differ from the control group, the differences may be attributable to selection and not to treatment. Comparing patients (*a*) who received treatment, (*b*) who had lesser contact with Altro, and (*c*) who were offered services but received none with the control group can provide a picture of how this selective process operated. We can attempt to match each of these sets of experimental patients with patients in the control group. But the rigor of random matching cannot be claimed except to assess the effect of being offered the opportunity to enter Altro.

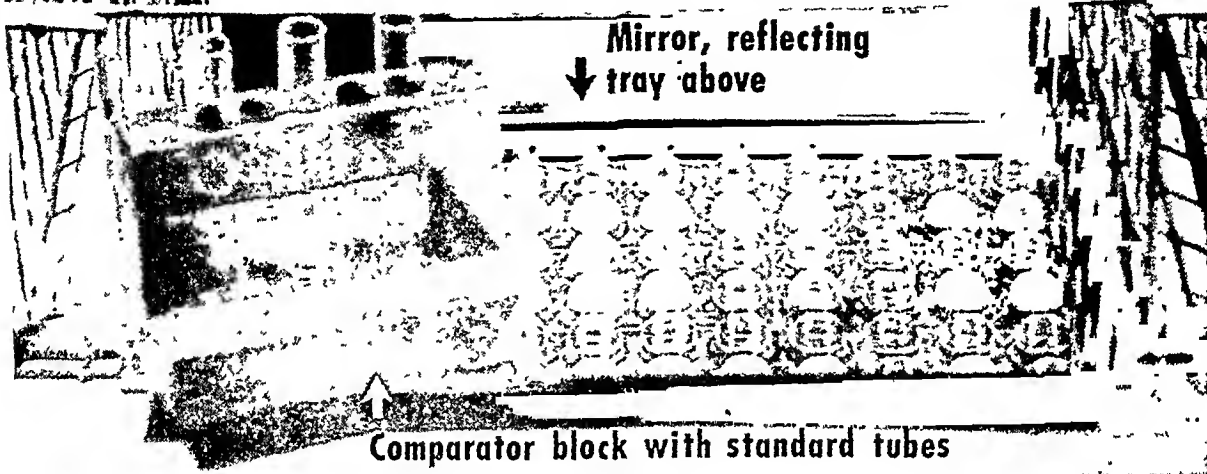
Inspection of the consequences of the selective process suggests that those patients reaching the rehabilitation program proper tend to be of two types: (*a*) those rather highly motivated to accept the kind of casework help and vocational training Altro offers, and (*b*) those who accepted Altro largely because they seemed unable to make any other sort of adjustment to the world outside of the hospital. Naturally enough, Altro is likely to feel that it is successful with the former and unsuccessful with the latter.

Were it possible to draw experimental and

Plastic tray
↓ containing specimens



Mirror, reflecting
↓ tray above



Comparator block with standard tubes

facilitates direct comparison (see figure).

When the test is finished, the trays are easily cleaned by flushing them under a tap, rinsing them in distilled water, and air drying.

One thousand specimens, formerly requiring 2,000 Kolmer test tubes, are now tested in 21 trays, each costing 47 cents. Each tray can be used at least 6 times, representing a cost of about 8 cents for 48 specimens.

Use of one tray is equivalent to the handling of 96 test tubes for refrigeration, incubation, and reading. In our laboratory, 500 complement fixation tests were performed by one technician utilizing the trays.

A tray, containing 48 specimens, can be read at a glance. The technician's hands are thus free while reading, enabling him to record results without clerical assistance.

Without sacrificing quantity, the

plastic tray technique permits use of one-half the quantity of reagent needed by the test tube method and effects a substantial reduction in the cost of personnel, refrigerator space, and cleaning facilities.

—DANIEL WIDELOCK, Ph.D., ANNA D. REYNOLDS, JOHN TRUELOVE, and EVELYN V. ENGELKE, *bureau of laboratories, New York City Department of Health.*

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technique

Use of Plastic Trays in the CF Test

The bureau of laboratories of the New York City Department of Health has found that transparent plastic trays are a practical and reliable substitute for test tubes in the Kolmer complement fixation test.

The bureau explored the use of plastic trays in an attempt to reduce the costs of syphilis serology without diminishing the quality of its work. Experiments determined that the Kolmer complement fixation test performed in one-half quantity in the wells of the plastic trays matches the results of the test tube procedure.

In a comparative study, 578 serum specimens were tested simultaneously in plastic trays and in test tubes, each test in duplicate. The readings on the two sets of tests were in agreement on 551 of the serums and in disagreement on 27.

Readings in agreement on the duplicate tests performed by each of the two techniques were:

| <i>Tube and tray tests</i> | <i>Serums</i> |
|----------------------------|---------------|
| R, R----- | 369 |
| R, WR----- | 1 |
| WR, WR----- | 3 |
| NR, NR----- | 169 |
| A/C, A/C----- | 9 |

Total in agreement--- 551

Readings in disagreement on the duplicate tests performed by each of the two techniques were:

| <i>Tube test</i> | <i>Tray test</i> | <i>Serums</i> |
|------------------|------------------|---------------|
| R, R---- | R, A/C----- | 2 |
| R, R---- | WR, WR----- | 7 |
| R, WR-- | WR, WR----- | 1 |
| NR, NR-- | WR, WR----- | 6 |
| NR, NR-- | WR, NR----- | 4 |
| NR, NR-- | NR, NR----- | 1 |
| R, R---- | NR, NR----- | 1 |
| WR, WR-- | NR, NR----- | 1 |
| WR, NR-- | NR, NR----- | 2 |
| R, R---- | A/C, A/C----- | 1 |
| NR, NR-- | A/C, A/C----- | 1 |

Total in disagreement--- 27

The degree of reactivity was determined according to the following scale:

Reactive (R)=10 to 100 percent complement fixation.

Weakly reactive (WR)=5 to 10 percent complement fixation.

Nonreactive (NR)=0 to 5 percent complement fixation.

A/C=test and control show equal or nearly equal inhibition of hemolysis.

In performing qualitative complement fixation tests in plastic trays, now routine in the bureau's syphilis serology laboratory, serum is put into the wells with a 0.2 ml. pipette,

and reagents prepared by Kolmer's procedure are added with automatic pipetting machines calibrated to deliver 0.25 ml. and 0.5 ml.

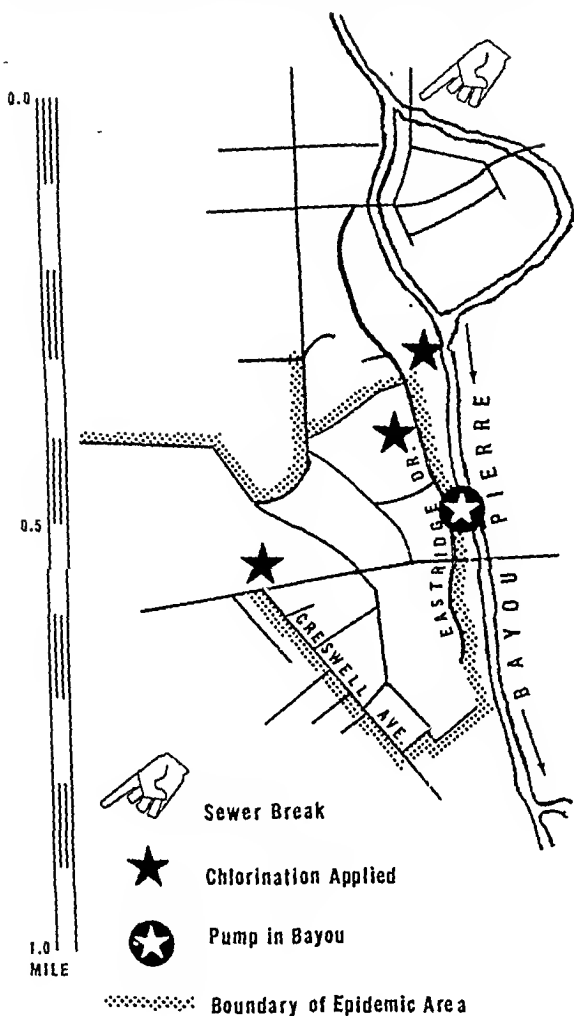
Reagents and serums are mixed by holding the tip of the pipette sufficiently high so that the force of ejection agitates the contents of the well.

After the trays are filled, they are stacked on top of one another, with sheets of cardboard in between, and refrigerated. The contents are given primary incubation by floating the trays on the surface of a 37° C. waterbath; reagents are added; trays are again placed in the waterbath and are then placed on a rack to be read.

The rack supports the tray about 3½ inches above a plate glass mirror reflecting the bottom of the tray to facilitate reading. A fluorescent bulb desk lamp, placed about 8 inches above the tray, shines directly through it.

Reading controls are prepared according to Kolmer's procedure. Reading standards are made by adding 1.5 ml. of 0, 5, and 10 percent standards to 75- by 12-mm. Kahn tubes. Serums with questionable reaction are transferred to Kahn tubes and compared directly with the standards. The comparator block

Site of enteritis epidemic in Shreveport, 1956



his house appeared green. An investigation was made, but the health department was not notified.

On August 11 a neighbor of Mr. X phoned the Caddo-Shreveport Health Department, stating that he, his wife, and his children were sick. He said there was a rumor that the water was bad. A sanitarian was immediately sent to the address to collect some water samples. The health department had no knowledge prior to this call of anything amiss with the city water supply. Because of the broken sewer line and the characteristics of the water, it was thought that sewage entering the bayou at this point was contaminating the water supply in the area.

On August 13, the water samples showed that heavy coliform contamination was entering the city water supply in the area where the com-

plainant lived. Eleven sanitarians went there immediately and began a search up and down the bayou for a possible cause of the bayou water entering the city supply. Within 2 hours they located Mr. X's pump in the bayou.

Some dye was put into the pump line to ascertain if the material would eventually reach the city main. The dye was detected shortly afterward in all the outlets in Mr. X's yard and in the city fire hydrant across the street.

As soon as there was proof of a direct connection between the bayou water and the city main, Mr. X was advised of the situation and asked to discontinue the use of the pump. He complied immediately.

The city water department severed the cross-connection and disconnected the water main from Mr. X's property. The contaminated line was flushed with clean water, and a heavy chlorine solution was allowed to remain in the line for a day or two. This procedure was repeated on several occasions, water samples being taken after each flushing. Beginning August 13, the sanitarians collected more than 300 water samples in the vicinity of the affected area and kept a continual surveillance of the water lines for chlorine residual. The people in the area were advised not to drink the water or else to boil it before use.

On August 14, health department nurses made a house-to-house canvass of the affected area for more epidemiological information. They found that approximately 70 persons had developed enteritis. The symptoms, similar in most cases, were nausea, vomiting, abdominal pains, tenesmus, and diarrhea, the latter bloody in some cases.

In laboratory examinations of stool specimens of some patients, *Salmonella infantis* was isolated from 1 specimen, *Salmonella panama* from 1, and *Giardia lamblia* from 2. *Salmonella oranienburg* was isolated from 1 water sample.

The local health officer and other physicians who attended patients made a diagnosis of dysentery on clinical evidence. Because of the danger of infectious hepatitis, gamma globulin was obtained from the Louisiana State Department of Health to administer to those who had been ill.

On August 23, none of the water samples

A broken sewer line and an improperly designed automatic lawn sprinkling system, which permitted bayou water to enter the city's main, led to 72 cases of enteritis in Shreveport, La.

An Epidemic of Enteritis Laid to Cross-Connection

FLOYD M. MILLER and
BEN FREEDMAN, M.D., M.P.H.

THE INCREASING use of water by a modern household for its many appliances increases public health hazards related to the water supply. The creation of more cross-connections, backflow connections, and open connections to accommodate these appliances and devices demands that sanitarians remain vigilant to prevent contamination of the water supply.

The misuse of one such device, an automatic lawn sprinkling system, led to contamination of the city water supply, resulting in an epidemic of enteritis in Shreveport, La.

In the summer of 1947, Mr. X installed a pump in Bayou Pierre, which flows behind his property, to supply water to the sprinkling system for the rear lawn of his home. His property is located in the southeastern area of Shreveport, the wealthiest residential section of the city.

In 1953 Mr. X installed for his front lawn an underground sprinkler system which drew its water from the city supply. This sprinkler system having been laid out in conformity with Shreveport's plumbing code, Mr. X applied to the city for a tap and meter for the system.

In June 1954, Mr. X installed an automatic time clock system and a booster pump in his

yard to use the bayou water for his w sprinkler system. At the same time, he replaced the pump in the bayou with another of horsepower capacity. He thought that the automatic timing system prevented a cross-connection. When the front sprinkler was connected to the bayou water system, the bayou water was not completely cut off from the city water main. Only a manually operated valve intervened between the city system and the bayou water system for the front lawn. This setup maintained a pressure in the sprinkler line of 65 pounds. Apparently, however, the pressure in the city water main at this point was at no time greater than 58 pounds.

Unfortunately, no inspection by the city plumbing inspector was requested. Mr. X's yardman, not knowing the hazard, opened the valves from the city water supply to prime the booster pump and left them open. Thus, when the time clock set the system into operation every 24 hours, water from both the bayou and the city main was forced through the system at the same time. Water from the bayou was probably forced into the city main for a fairly long period, since the two gate valves were found in the open position.

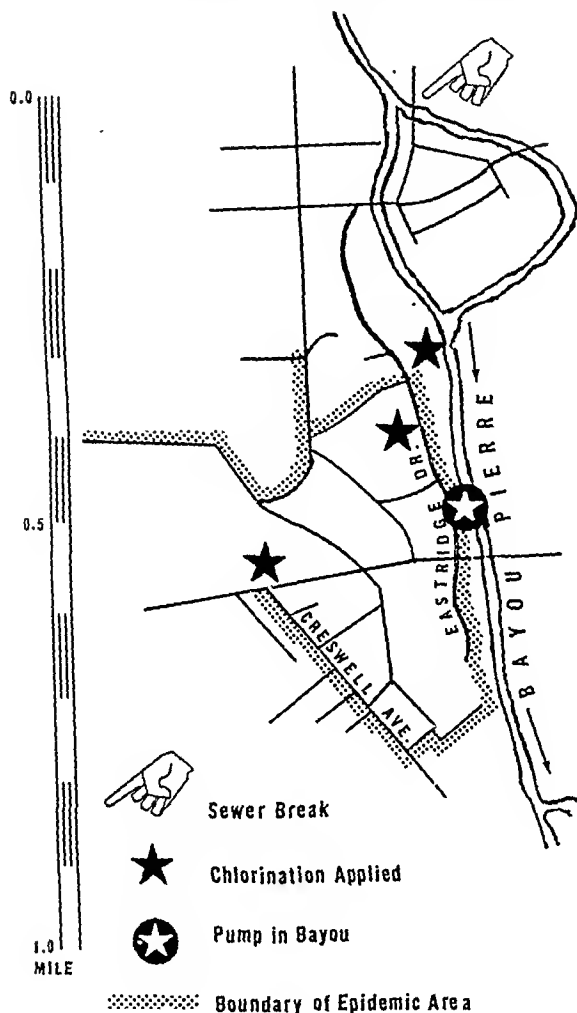
The Investigation

On August 7, 1956, a broken sewer line just off Bayou Pierre, about one-half mile from Mr. X's pump, was reported to the health department (see map). Investigation on August 8 revealed that the sewage from the broken line was draining into the bayou, and that the break had occurred about the beginning of August. Previously, the bayou water was fairly clear.

On August 8 the sewer break was corrected. The same day, the office of Shreveport's commissioner of public utilities received a call from a resident who said that the hydrant water in

Mr. Miller is chief sanitarian of the Caddo-Shreveport Health Unit and Dr. Freedman is director of the division of preventive medicine, Louisiana State Department of Health.

Site of enteritis epidemic in Shreveport, 1956



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On August 11 a neighbor of Mr. X phoned the Caddo-Shreveport Health Department, stating that he, his wife, and his children were sick. He said there was a rumor that the water was bad. A sanitarian was immediately sent to the address to collect some water samples. The health department had no knowledge prior to this call of anything amiss with the city water supply. Because of the broken sewer line and the characteristics of the water, it was thought that sewage entering the bayou at this point was contaminating the water supply in the area.

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On August 23, none of the water samples

were positive. The water supply was officially declared safe for use 5 days later.

Analysis of Data

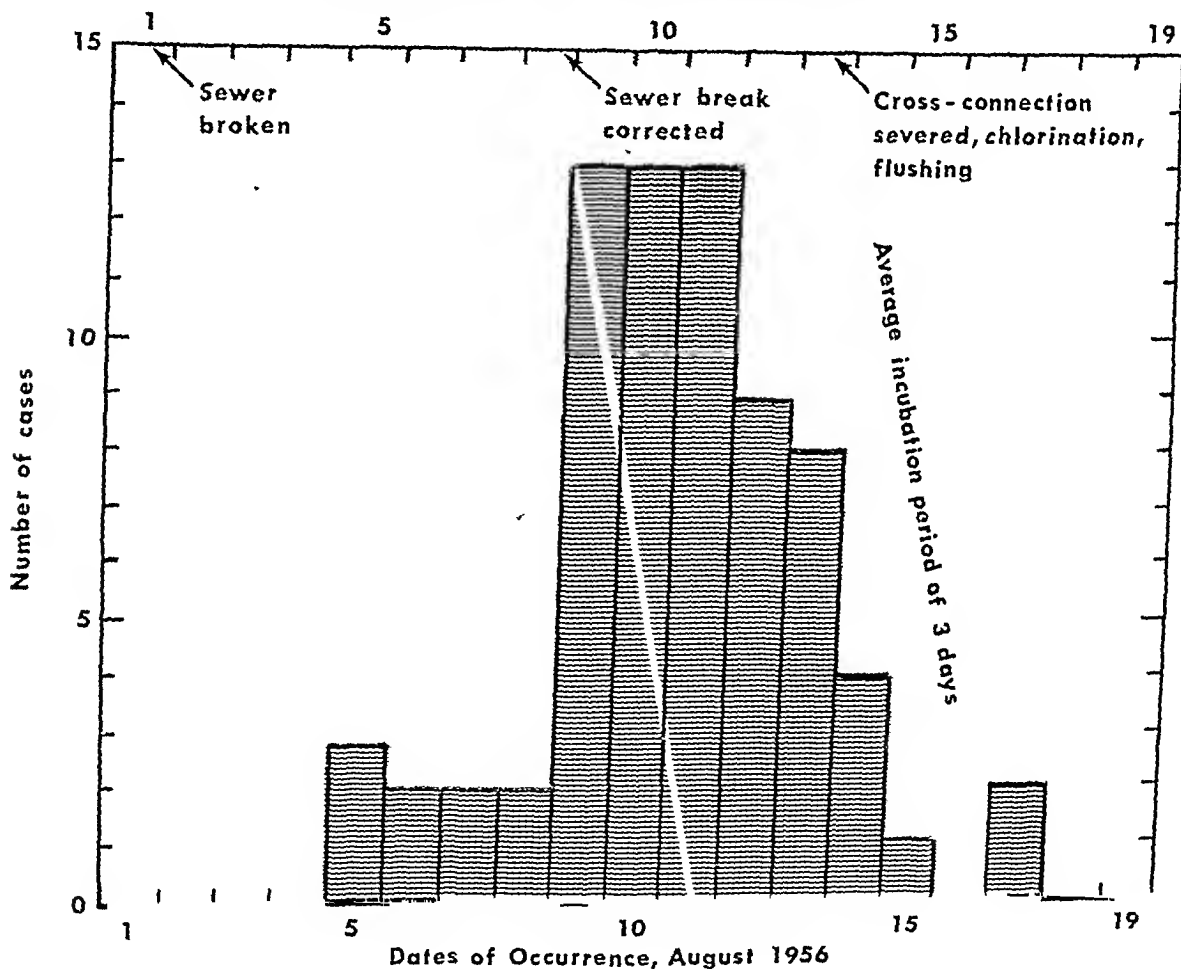
The data collected showed that 40 females and 32 males developed enteritis. Most of the cases occurred in children under 10 years of age, and in adults 35 years of age and over; only 2 were in infants. The total of 72 cases, none fatal, occurred in 27 households whose population was approximately 125. The attack rate, therefore, was about 60 percent.

Fifty-six of the cases occurred between August 9 and 13. This suggests that a common agent and a common set of circumstances acted over a short period of time.

The cross-connection between the lawn sprinkling system and the public water supply may be considered as the initiating factor of the epidemic because of these circumstances:

1. All the cases occurred in households supplied by the water main contaminated by the cross-connection on Mr. X's property.
2. The bayou water was heavily contaminated because of the sewer break near Mr. X's property.
3. The dye test showed that the bayou water was reaching the city main in a relatively short interval.
4. The water pressure in the sprinkling system was greater than in the public water supply.
5. The gate valves in the sprinkler system

Occurrence of cases of enteritis in relation to incubation period, sewer break, correction, and beginning of control measures, Shreveport, La., 1956



line were frozen open, allowing the bayou water to flow into the public system.

6. The sewer break was corrected on August 8, and 3 days later the number of cases began to decrease.

7. The last primary case occurred 3 days after the cross-connection was severed and the water supply received increased chlorination.

In the neighborhood where the epidemic occurred, 206 water samples were taken from 69 residences. More than one sample was taken from most households; 62 of the samples were positive, 144, negative.

These results indicate that the contaminated water supply was the offending agent: among households with no cases, twice as many had all negative samples (30) as had at least one positive sample (16); twice as many of the households with cases had at least one positive sample (15) as had all negative samples (8).

All 16 samples taken on August 11 and 13 were positive for coliform bacilli. After chlorination was begun and the cross-connection was severed, 1 sample in every 4 was positive. This ratio later decreased to 1 in every 5, and after August 23 no more positive samples showed up.

Considering that the first cases occurred August 5 and the last two on August 17, the outbreak was probably caused by a stepped-up contamination of the water system beginning when the sewer line was broken (see chart). Since the buildup of contamination in the bayou water took several days, heavy contamination conceivably did not reach the property of Mr. X until August 6 or 7. With 3 days incubation for the offending agent, heavy contamination should have been reflected in a peak of cases about August 9; the actual peak was August 9-11.

The precipitous decrease in the number of cases began 6 days after the sewer break was corrected. This decrease is expected if we accept the premise of the incubation period and of dilution lessening sewage contamination in the bayou.

The epidemic apparently began to subside because the sewer line was repaired. But straggling cases may have been prevented by the later control measures, whose effect should have

been manifest by August 16. On that date, no new cases occurred (see chart).

The case distribution among families seems to indicate that none of those occurring up to August 11, the last day of the epidemic's peak, were family contacts. Of the 24 subsequent cases, 13 could have stemmed from family contacts, including the last 2, occurring on August 17 in households where other persons had enteritis about a week earlier.

No definite bacterial agent was isolated in stool examinations. The sequence of events, however, does fit the theory of an agent with a 3-day incubation period. The illnesses could also have been caused by a filtrable virus.

We must consider the possibility that the epidemic was caused by sewage intoxication. If this was true, then the epidemic should have ceased several days after the control measures were taken on August 13. For all practical purposes this actually happened (see chart). The plausibility of intoxications is partly affirmed by the fact that no definitive causative bacterial agents were isolated from stool specimens, although a viral agent remains a possibility. But if intoxication was the cause, then the presumption of contact cases is invalid.

The specific offending agent of the epidemic remains unknown. A bacterial source is possible, but a viral agent, a sewage intoxicant, or a combination of offending agents is also plausible. That the vehicle of transmission of the offending agent was the bayou water is quite clear, and that the offending agent was associated with the sewer break is circumstantially evident.

If more information on water supply hazards had been exchanged between the local public utilities department and the health department, action to control the epidemic would probably have been quicker.

The Official Response

As a result of these events, the Shreveport City Council adopted an emergency ordinance requiring that all sprinkler systems be registered with the city plumbing inspector, and the plumbing board urged that the plumbing code be enforced to the letter.

Control of Silicosis in Vermont Granite Industry

PHS Publication No. 557. 1957. 65 pages. 40 cents.

Results of a study of the effectiveness of methods to prevent silicosis in the Vermont granite industry are described in this progress report. It traces early studies of silicosis in the industry and developments in engineering control of granite dust, describes the current silicosis control program, and presents findings of a re-study conducted in 1955 by the Public Health Service in cooperation with the Vermont Department of Health.

The report demonstrates that great strides can be made in national control of silicosis by properly applied medical and engineering measures.

Patients in Mental Institutions, 1955

Part I. Public Institutions for Mental Defectives and Epileptics

Part II. Public Hospitals for the Mentally Ill

Part III. Private Hospitals for the Mentally Ill and General Hospitals With Psychiatric Facilities

Part IV. Private Institutions for Mental Defectives and Epileptics

PHS Publication No. 574. 1958. Part I, 55 pages. Part II, 72 pages. Part III, 41 pages. Part IV, 26 pages.

Based on the 30th Annual Census of Patients in Mental Institutions, the ninth to be conducted by the National Institute of Mental Health, these publications present basic statistical data on the movement of the patient population of mental institutions in each State and in the United States.

The public institution and public hospital reports, parts I and II, con-

tain detailed tables on first admissions, resident patients, personnel employed, and expenditures for the care of patients. Parts III and IV carry data on the characteristics of first admissions to private mental hospitals and to private institutions for mental defectives. Statistics on the characteristics of discharges from general hospitals with psychiatric facilities are also included in part III.

Public Participation in Medical Screening Programs

A Sociopsychological Study

PHS Publication No. 572. 1958. By Godfrey M. Hochbaum. 23 pages; tables and charts. 15 cents.

Results of an intensive behavioral research study on determinants of voluntary participation in free medical screening programs are reported in this monograph. Although tuberculosis case-finding programs were used as source material for the study, the methodology and findings can be applied to screening activities in other disease detection programs. The findings relate to such factors as information, fear, socioeconomic level, and social forces. The study was sponsored by the National Tuberculosis Association and the Public Health Service.

Education, Training, and Utilization of Sanitary Engineers

National Academy of Sciences, National Research Council Publication. 1957. 17 pages.

Findings and recommendations of the Conference on Education, Training, and Utilization of Sanitary Engineers are summarized under three headings: career opportunities,

recruitment and recruitment incentives, and educational objectives.

The conference was held under the auspices of the Subcommittee on Personnel and Training of the Committee on Sanitary Engineering and Environment of the National Academy of Sciences, National Research Council in Washington, D. C., March 1957.

Copies of the report can be obtained from the Division of Sanitary Engineering Services, Attention: Engineering Resources Program, Public Health Service, Washington 25, D. C.

Births and Neonatal Deaths By Birth Weight: Reporting Areas, 1952-54

Vital Statistics—Special Reports. Selected Studies. Vol. 47, No. 1, Dec. 16, 1957. 19 pages; tables.

This is the second in a series of reports compiling comparative statistics on neonatal mortality by birth weight for States and cities. Vital records for 1952-54 served as a basis for the data, with information on mortality by birth weight obtained from certificates for matched births and neonatal deaths.

Distributions of births by weight and weight-specific neonatal mortality rates for white and nonwhite infants, as well as summary figures for prematures, are included in the data

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared by other Federal agencies.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications other than its own.

This comprehensive account of the growing challenge of transportation hazards to health and safety strongly emphasizes the responsibility of both physician and public health officer in preventing accidental trauma.

Health and Safety in Transportation

ROSS A. McFARLAND, Ph.D.

THE ASSURANCE of health and safety in transportation has become one of the basic needs in modern life. In certain areas of the world, safety in transit is assuming even greater importance than problems relating to food, shelter, and clothing. In the United States, for example, extensive mechanization of the environment, diverse industrial procedures, and increasing use of transport vehicles have resulted in new threats to the well-being of large sections of the population.

The important role played by human variables in causing accidents brings the control of accidents within the province of preventive medicine and public health. The physician and the public health officer, with their broad training in the biological sciences, are especially qualified to improve safety in industry, in the home, and in various forms of transportation.

Efforts in the control of accidents can be

strengthened by the application of epidemiological techniques. The methods which have been used so effectively in the control of infectious disease can be broadened to prevent injuries, especially on the highway and in the air (1). Since most accidents have multiple causes, the interactions between the "host" (driver, pilot, or operator), the "agent" (vehicle, plane, and equipment), and the "environment" are important considerations in attempts at control. While the host factors are of particular interest to physicians, they must be viewed in their relationships to the agent and the environment for an adequate understanding of accident causation (2).

Because human variables are especially important in causing accidents, the physician or the public health officer has a direct responsibility in the prevention of injury. Moreover, since memory operates most effectively when reinforced by emotion, the physician is in an especially favorable position to teach while treating and to indoctrinate patients with the principles of accident prevention. It is thus of great importance for the physician to take the initiative in identifying the causes of accidents in order to institute preventive procedures (3).

Current approaches to the control of accidents may possibly be reaching the limits of their effectiveness. The next significant advances in safety may result from a combined approach which includes the engineering and

Dr. McFarland, who is professor of environmental health and safety at the Harvard School of Public Health and director of the Guggenheim Center for Aviation Health and Safety, is a prolific author on the subject of transportation safety. The paper was delivered in essentially the same form before the American College of Preventive Medicine in Cleveland, Ohio, on November 13, 1957. Many of the studies reported were sponsored by the Commission on Accidental Trauma of the Armed Forces Epidemiological Board, Department of Defense, and supported in part by funds from the Office of the Surgeon General, Department of the Army.

biological sciences. This collaboration is not new in medicine, and such an approach has been the basis of many important developments. For example, the control of malaria was achieved by cooperation between the entomologist, the sanitary engineer, and other specialists. The physiologist, the psychologist, the anthropologist, the engineer, and the physician can similarly cooperate to obtain basic data in order to achieve improved prevention of motor vehicle accidents (4).

Transportation Facts and Figures

A few examples of the extent to which passenger transportation has increased in modern times show the magnitude of the problem.

In 1956, buses, automobiles, taxis, and trucks, operated by 77 million licensed drivers, traveled some 630 billion miles on the highways in the United States. Drivers and passengers in automobiles and taxis alone accounted for 970 billion passenger-miles of travel; 51½ billion passenger-miles were recorded in intercity bus operations.

In aviation the volume and speed of travel have been increasing very rapidly. During the first 24 years of the air transportation industry, that is, up to 1950, 100 million revenue passengers were carried by scheduled domestic and international carriers in the United States. By 1957, 349 million revenue passengers had been carried. The number of revenue passengers on airlines of the United States in 1956 was about 46 million. These represented about 70 percent of the total world volume of 68 million revenue passengers on airlines. In 1956 for the first time more passengers were carried to Europe by air than by ocean liner, and 68 percent of all passenger traffic between the United States and other nations was by air. Helicopter scheduled airlines were nonexistent 5 years ago. In 1957, this new type of service carried 152,000 passengers (5, 6).

The transition from piston engines to jet propulsion will impose new and interesting problems in the next few years. Approximately 350 jet transports are now on order. These planes will carry as many as 140 passengers each at a cruising speed of approximately 600 miles per hour.

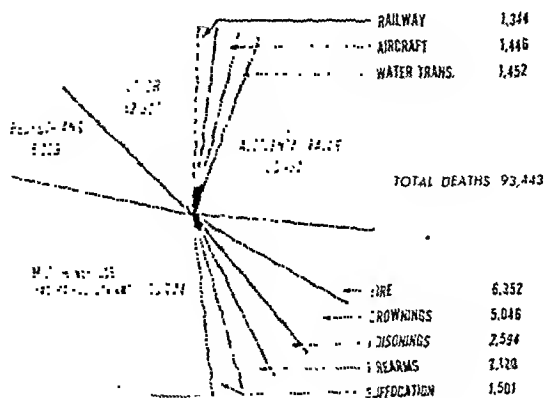
The number of revenue passengers using the railways exceeds 400 million per year, excluding commuters. Also, in 1956, more than 9 billion separate fares were paid by local transit riders.

It is now apparent that almost everyone uses some mode of travel or another, not once, but many times during the course of the year. The exposure of our populations to travel hazards has reached enormous proportions both in relation to accidental injury and the threat of exposure to certain diseases.

The frequency of accidents now presents a major problem. Each year approximately 95,000 persons are killed in various kinds of accidents in the United States (fig. 1). About 350,000 others receive permanently disabling injuries, and temporary disabilities severe enough to keep them away from work for at least a day are incurred by 9½ million persons. These accidents occur mainly in the home, on the job, and during transit. Accidents in various forms of transportation, particularly on the highway, have reached epidemic proportions. Since the invention of the automobile there have been more than a million fatalities in motor vehicle accidents in the United States; in 1957, highway accidents accounted for 41 percent of all accidental deaths. The annual direct costs of traffic accidents approximate 2 percent of the national income (7, 8).

Fatal accidents involving persons under 35 years of age formed a large proportion of the

Figure 1. Accidental deaths in the United States during 1955.



SOURCE: Reference 7.

total deaths in highway accidents. This implies an enormous drain on the productive resources of the country. Accidents are the leading cause of death for persons between 1 and 34. They are exceeded only by heart disease and cancer for those between 35 and 44 years of age (9).

In the armed services, accidental trauma is now a major problem. During World War II the United States Army reported more deaths among its soldiers caused by accidents than by disease for the first time in its history. In the Korean conflict more than half of the hospitalized casualties resulted from accidents rather than from enemy action. Of these, 70 percent were incurred in motor vehicle accidents (1). The frequency of motor vehicle accidents in all three branches of the Armed Forces has become very serious, and accidents now exceed upper respiratory infections and rank first as the leading cause of man-days lost. Motor vehicle accidents account for about 2,100 fatalities of servicemen each year, a large majority occurring while personnel are off duty (10).

The integration of motor vehicles into our way of life has become very costly in fatalities, injuries, and damaged equipment. In spite of the enormous increase in volume of highway traffic, there has been a significant decrease in accident rates during the past 25 years. For example, in 1957 the fatality rate per 100 million miles of travel was only 5.9, in comparison with the rate of approximately 15 about 20 years ago. Nevertheless, the actual number of persons killed or disabled and resulting costs to the Nation's economy have increased from year to year with only a few exceptions apart from the period of restricted travel during World War II. In 1957 there were approximately 38,500 deaths and 1,350,000 injuries disabling beyond the day of the accident (7). According to present trends, it is estimated that 1 of every 10 persons in the country will be injured or killed in a traffic accident during the next 15 years (8).

The safety record of scheduled airlines in the United States is an enviable one in relation to the exposure. Only 154 fatalities were reported for 1956, with the 128 deaths in the Grand Canyon accident accounting for approximately five-sixths of this total (5). In 1957,

there were 31 deaths. Business flying is reasonably safe, but private flying has a relatively poor record. There were 655 fatalities in 1956 in 3,411 accidents among 65,000 business and private planes. Thus, 1 in about every 19 of these airplanes was involved in an accident. Crop dusting by airplanes, of great importance to both public health and agriculture, is also hazardous. Military flying obviously involves increased hazards. However, in United States naval aviation there is now only about one fatality per day. For example, in 1956, there were 413 deaths attributable to aviation accidents (11). In the U. S. Air Force, with its far more extensive operations, deaths have been reduced to about three per flying day (12). In 1955, there were 825 fatalities.

To determine precisely the relative safety of different kinds of transportation is impossible because of the lack of a satisfactory common denominator for a valid comparison. The nature and frequency of the hazards encountered differ greatly among the various forms of transport, as does the number of passengers exposed to danger of injury in the different types of vehicles (13).

At present, death and injury rates per 100 million passenger-miles are used in estimating the safety of travel, and, on this basis, table 1 shows the accident death rates in passenger transportation (5, 7). While deaths per 100 million passenger-miles is not a wholly satisfactory basis for this comparison, it appears that on the whole buses and trains have the lowest rates. Those for automobiles and taxis are much higher, and air transportation occupies a

Table 1. Accidental deaths of passengers per 100 million passenger-miles in United States transportation, 1947-56

| Type of carrier | 1947-51 average | 1952 | 1953-55 average | 1956 |
|------------------------------------|--------------------|------|--------------------|------|
| Scheduled air transport: | | | | |
| Domestic | 1.6 | 0.37 | 0.49 | 0.64 |
| International | 1.1 | 2.98 | .03 | .17 |
| Railroad passenger trains | .27 | .04 | .10 | .20 |
| Intercity buses | .19 | .16 | .14 | .16 |
| Automobiles and taxis .. | 2.2 | 2.8 | 2.7 | 2.7 |

SOURCE: References 5 and 7.

middle position, slightly above those for trains and buses. Actually, the accident frequency rates for air transportation are quite low; the fatality rates reflect chiefly the fact that there are few survivors in the major accidents.

Epidemiological Approach

A basic step in the application of the epidemiological approach is determining the fundamental physical, physiological, and psychological characteristics of the host. When these data are correlated with the characteristics of the agent (vehicles and equipment) under specific environmental conditions, the resulting information will shed light on the causes of accidents and aid in developing preventive measures. To obtain this kind of information experimental and clinical studies, epidemiological surveys, and careful statistical analysis are required (3).

An epidemiological approach to highway safety in the armed services was applied in a recent study sponsored by the Commission on Accidental Trauma of the Armed Forces Epidemiological Board. About 88 percent of highway accidents in the Navy and Marine Corps occur while the personnel are off duty. The epidemiological method was used to study this problem at a major Marine Corps base.

It was previously supposed that the main problem concerned fatal accidents during weekend periods on considerably long automobile trips. The study showed, however, that 96 percent of the accidents occurred within a 50-mile radius of the base, and 71 percent within 10 miles. The greatest percentage of accidents occurred between 6 p.m. and midnight, that is, during the evening recreation period. The analysis identified the young, unmarried enlisted men of low rank who live on the base in Government quarters as having a highly disproportionate share of the accidents. These findings have formed the basis for a new accident control program at this military installation (10).

It will not be possible to present a complete analysis of the epidemiological approach in both the highway and air transport fields, and primary emphasis will be given to the findings relating to highway safety. However, there are

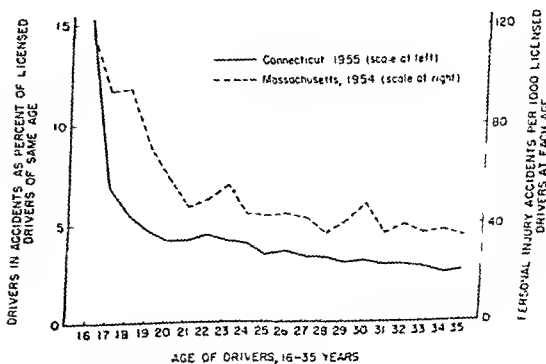
several interesting problems in the field of air transportation which have far-reaching implications for the health and safety of large sections of the population, and a few of these will be singled out for special mention. The first one concerns the medical care of the flight crews and the handling of problem medical cases. This will be considered in the discussion of host factors. The second refers to the possibility of spreading disease by aircraft, which will be treated under the heading of host-agent factors in health and safety. The third involves host-environment relationships in connection with the transportation of patients by air, and the problems which may arise from a loss of pressure in pressurized air transports.

Host Factors in Accidents

Thus far no single characteristic of drivers has been identified which accounts for a large proportion of accidents on the highway. This is true for a variety of sensory, psychomotor, and psychological investigations (8, 14). A few useful generalizations may be made, however, about driver characteristics in relation to accidents.

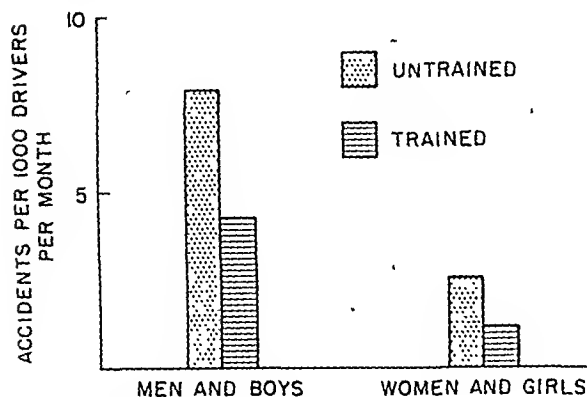
Results of a number of studies clearly indicate that, in relation to their numbers, drivers up to the age of about 25 have accidents more frequently than do those from 30 through 60 or 65 years of age. The most recent and complete information, from Massachusetts and Connecticut, indicates the highest rates for the

Figure 2. Frequency of accidents among drivers aged 16 to 35, based on Connecticut and Massachusetts experiences.



SOURCE: References 15 and 16.

Figure 3. The safety record of trained drivers compared with that of untrained, based on 1,226 accidents during an exposure of 300,536 driver-months.



SOURCE: References 8 and 17.

youngest drivers, those of age 16. The rate decreases with succeeding years of age, rapidly at first and then more slowly (fig. 2). It levels off at about age 30 and remains stable and relatively low through age 65 (15, 16). Data related to ages above 65 are as yet too meager for interpretation. The factors responsible for the higher rates for youthful drivers are believed related to inexperience and to psychological characteristics of youth in the adolescent and early adult phases of adjustment (8).

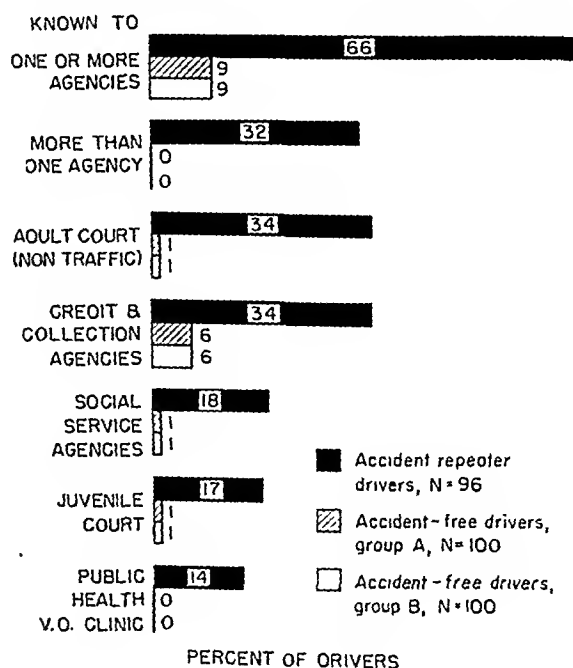
In the United States, roughly 10,000, or about half, of the high schools in the country offer classroom instruction in highway safety and training in the operation of automobiles. A number of studies have been made on the effectiveness of this training. The results, shown in figure 3, agree substantially that the accident rates of trained drivers are about half as high as those of untrained, at least during the first few years of driving (17). Many of the reports also indicate fewer violations of traffic regulations by trained drivers. It is also apparent that classroom instruction alone is less effective than a combination of classroom instruction and behind-the-wheel training. It thus appears that the adequate initial training of drivers constitutes an important method of reducing accidents in a portion of the driving population presently characterized by the highest rates. There is still the need, however, for research on what should be taught, on ways

to provide training in driving under adverse conditions and in the handling of emergency situations, and on ways to expand training programs to include all beginning drivers (8).

Of the greatest importance in driving safety are the attitudes and personal adjustments of drivers. A useful concept which has been developed in this area is that "a man drives as he lives." Studies of accident repeaters and accident-free drivers carried out in Canada showed that maladjustments in meeting the personal and social demands of living were far more frequent among the accident repeaters than among accident-free groups. A promising method for the identification of accident-repeater drivers resulted from this study (18). It was found that, as a group, the accident repeaters could be differentiated from the accident-free drivers on the basis of the number of contacts with such agencies as the civil and criminal courts, collection agencies, public health clinics, and social welfare agencies (fig. 4).

The same procedure was subsequently ap-

Figure 4. Personal and social adjustments of accident repeaters and accident-free drivers matched for geographic location and driving experience.



SOURCE: Reference 18.

plied to a large sample of truck drivers in a study at Harvard. Accident-repeater and accident-free drivers were carefully matched to meet rigid standards, and various public records were searched for their names. Findings very similar to those in the Canadian study were obtained. A statistical analysis by the chi-square technique was made to determine the relative usefulness of the various indexes of antisocial or maladjustment tendencies in differentiating those with repeated accidents from those without accidents. The relative value of selected items in discriminating between accident-free and accident-repeater drivers has been developed in the following manner:

| <i>Item</i> | <i>Chi-square</i> |
|--|-------------------|
| Court record of automobile offenses..... | 7.48 |
| Minor violation in motor vehicle records..... | 6.76 |
| Court record of offenses against persons..... | 6.43 |
| Unfavorable business inspection report..... | 3.84 |
| Court record of offenses against self..... | 2.55 |
| Court record of offenses against property..... | 2.01 |

The values for the individual items having greatest significance were applied as weights to the information obtained on a new sample of unselected drivers. In this preliminary experiment the procedure identified the accident repeaters in the sample with an accuracy of 85 percent (19).

In another study information from the service records of 210 military pilots who had been killed in noncombat aircraft accidents was compared with records of a 20 percent sample of reserve pilots discharged after satisfactory service (personal communication). A record of disciplinary charges was found for 48 percent of the fatal accident group as against 31 percent of the control group. "Violation of flying orders" was the most discriminative type of offense—21 percent of the fatal accident group as against only 2 percent of the controls. Nonflying disciplinary infractions were also significantly different in the two groups, the accident group rating higher in resistance to order and discipline. Also noted in the accident group were the larger proportion of pilots who had not completed high school and the larger proportion of pilots who changed jobs frequently prior to enlistment.

An intensive investigation of personality factors in relation to accidents is currently being

made at the University of Colorado. This approach includes extensive psychological testing and intensive psychiatric evaluation. One group test—a modified form of the Allport-Vernon Scale of Values—has provided a 70 percent accurate discrimination between no-accident drivers and those with a high-accident record. Characteristically, and in contrast with the accident-free, those drivers who have had accidents scored high on the theoretical and aesthetic scales and low on religious values. Through a combination of the test results and the clinical material, it appears that the accident-prone driver is less likely to identify himself with the father, more likely to consider authority figures unpleasant, and more likely to show an excess of regressive, masochistic fantasy. The most useful tests are now being given to all of the high school students in the city of Denver. The results will be correlated with their subsequent driving records (10).

In situations involving time stress and complex reactions, the lower accident-rate for adult and middle-aged drivers is clear, but for persons past middle age there is some evidence that the rate may increase. It is known that reaction times tend to become longer with advancing age, and impairment in the efficiency of all the senses occurs. Many persons, however, develop compensating habits offsetting these losses. It is believed, for example, that older drivers tend to drive slower and to do less driving at night.

Research carried out at Cambridge University on the effects of aging on skilled performances has suggested the kinds of situations in which aging persons might be especially vulnerable to accidents. The implication is that when an older driver is required to assimilate a novel or complex situation instantaneously, and to carry out a rapid sequence of reactions, he is apt to become confused and make errors. Without time pressure and in familiar situations, a more adequate or efficient response can be expected (13, 20).

Many accidents occur when the efficiency of the driver is impaired by some temporary condition. The efficiency and safety of driving may be adversely influenced by a variety of temporary states, although, in general, statistical

proof of the importance of a given type of condition may be very difficult to obtain. For example, the role of fatigue in asleep-at-the-wheel accidents appears quite clear, but fatigue may be a more subtle factor in many other accidents. When drivers are emotionally upset or preoccupied with personal problems, alertness to the driving situation may be diminished. Alcohol is widely cited as a cause of accidents. And what may be the influence of concurrent disease or of various abnormal physical conditions? Also, is safety compromised as a result of either the direct or side effects of various drugs and remedies taken for a variety of medicinal purposes (8, 14)? The following are several of the findings concerning the influence of temporary conditions.

Driver fatigue is not only related to the length of time spent in driving. Consideration also must be given to such factors as amount and quality of previous rest, the nature of activities prior to driving, and concurrent emotional stress. In addition to the subtle disorganization of skill which develops with increasing fatigue, drivers when extremely tired may experience hallucinations of obstacles on the highway, and a number of accidents have been traced to actions taken by drivers to avoid collision with these imagined barriers. When interviewed confidentially, more than half of a sample of professional drivers engaged in long-trip driving admitted having had such experiences (19).

Driving skill is adversely influenced in many with as little alcohol in the blood as 0.03 and 0.04 percent. The likelihood of an accident increases constantly as the alcohol in the blood increases from the lowest levels (8, 14). The risk at 0.10 percent is estimated to be more than twice that at 0.05 percent, while the risk at 0.15 percent appears about tenfold (table 2). These data are from a recent study in Canada (21). Additional data from the same study (22) show that as the level of blood alcohol increases, there is an increase in driving errors which result in accidents. In several series of autopsies recently made on drivers killed in accidents in the United States, significant amounts of alcohol were found in the blood and brain fluids of more than half of the cases.

A physiological fact which may have special

importance is that, while initially there is a close correspondence between the levels of blood alcohol and brain alcohol, the alcohol is eliminated more slowly from the fluids surrounding the brain than from the blood. Thus, elevated concentrations of alcohol may be found in the spinal fluid for some time after blood values have become negligible (13).

Through control of problem medical cases preventive medicine has an important role in reducing accidents on the highway and in the air. The questions of physical fitness to drive and the influence of pathological processes in accidents are of particular interest to physicians.

Most authorities would agree that epileptics, diabetics requiring insulin, and those with certain heart conditions should not operate public highway conveyances or pilot airliners because of the hazard of a sudden loss of consciousness. But what of the influence of such conditions in the general driving public and what cutoff points should be kept in mind? There are, for example, about 6 million truck drivers in the United States, yet it is known that only a small proportion of them receive thorough physical examinations, and that the development of adequate medical programs for the large number of workers in the transport industry remains to be accomplished. It would be expected that in this occupational group, a certain number use insulin, experience temporary impairments of consciousness, or have fairly advanced heart disease of one form or another (8, 19).

In the interest of prevention, does not the

Table 2. Accident hazard in relation to blood alcohol

| Percent of alcohol in blood | Percent of accident drivers (N=432) | Percent of drivers not in accidents ¹ (N=2,015) | Ratio of accident drivers to non-accident drivers | Relative accident hazard |
|-----------------------------|-------------------------------------|--|---|--------------------------|
| 0.0-0.05----- | 77.5 | 91.3 | 0.85 | 1 |
| 0.05-0.10----- | 7.1 | 5.4 | 1.31 | 1.5 |
| 0.10-0.15----- | 4.0 | 1.9 | 2.1 | 2.5 |
| 0.15 and over--- | 11.3 | 1.4 | 8.1 | 9.7 |

¹ Drivers not involved, but passing the accident scene shortly after the accident.

SOURCE: Reference 21.

physician have a responsibility to indoctrinate the patient and the public regarding the influence of disease on driving and the effects on human behavior and efficiency of prescriptions and medications employed? Within the patient-physician relationship, must not the cardiologist, for example, estimate the likelihood of sudden loss of consciousness in various forms of heart disease and advise his patients whether it is safe to drive? In this connection, what advice should the physician give his diabetic patient? Or how is safety compromised when with advancing age changes in sensory functions and reaction time can no longer be compensated by training and experience? How can the patient-physician relationship be reconciled with the physician's responsibility for the prevention of injury when there is a question of public safety?

Unfortunately, there are few controlled experimental data available to determine precisely the role of various clinical conditions in highway safety, or to establish medical criteria and cutoff points concerning fitness to drive. Conditions involving a sudden loss of consciousness provide the most dramatic illustrations of the influence of disease in accidents. For example, in England the incidence of coronary thrombosis over a 5-year period was studied among the bus drivers of the London Transport Executive. There were 133 cases. Six prompt fatalities occurred while the driver was at the controls of a bus. Three of these resulted in accidents. In the other three attacks, the operator was able to stop the vehicle without harm (23).

The need for research to evaluate the influence of specific conditions in traffic accidents and to establish critical cutoff points is very great, and physicians obviously can make important contributions in this regard. The limitation on driving for persons with various illnesses or disabilities presents a serious problem. The American public, moreover, does not readily accept limitations on personal freedom. An arbitrary prohibition of driving for all those afflicted with certain conditions would be needlessly restrictive and unfair to many persons, and cooperation between the medical profession and the motor vehicle authorities in handling these problems on an individual basis is essential. Several studies have shown that

drivers with quite severe physical limitations may have safe records if they are carefully supervised by their physicians. In Massachusetts, for example, a satisfactory safety record has been found with certain high-risk drivers permitted to hold licenses and drive under a program of continuing medical surveillance. These drivers include persons with such disabilities as epilepsy, diabetes, multiple sclerosis, and various amputations and paralyses (8).

If the problem of medical fitness to drive is to be satisfactorily worked out, large-scale studies of persons with various disabilities must be carried out to let them help decide which of this group should not drive. For example, a physiological and clinical study of 1,000 diabetics, together with statements from them about critical incidents and episodes and how they have been influenced in a dangerous way, would supply needed information in this area. Such a study might prove a more acceptable approach than the setting of arbitrary cutoff points without an experimental basis. A study of this type is at present being carried out at the Harvard School of Public Health.

In the field of air transportation, airline pilots receive periodic physical examinations through designated medical examiners of the Civil Aeronautics Administration. A few of the 80 airlines of the world have good medical departments, but less than one-fifth of the scheduled airlines have formal medical organizations. The report that each month, for a 5-month period in 1957, a pilot on active duty died while in the cockpit will emphasize the importance of continuing medical supervision, as well as of the value of having a co-pilot. One of the pressing problems in this area relates to the changing age distribution of airline pilots. With many of these men now entering age groups beyond 45 and 50, many problems of health and safety may be anticipated (24).

The findings for 232 problem medical cases among transport pilots have been followed through a period of 20 years. Permanent grounding resulted in only 83 cases, all of the others having returned to duty (13). The majority of cases were classified as neuropsychiatric and cardiovascular. Such studies are of great value in the delineation of cutoff points

for airline pilots, and, furthermore, they do not support the belief held by many pilots that a serious illness necessarily results in permanent grounding.

Host-Agent Relationships

A number of findings concerning transport health and safety relate to interactions between the host and agent. In the vehicular field host-agent relationships are primarily concerned with the effective integration of the man-machine combination. In order to promote that integration, automotive equipment should be designed with regard to human capacities and limitations.

Mechanical design should be intimately related to the biological and psychological characteristics of the driver. It is reasonable to expect, therefore, that machines should be designed from the man outward, with instruments and controls considered as extensions of his nervous system and appendages. This implies that the automobile should be built around the operator, with due regard for his requirements and capacities. When this is done there should be fewer accidents and no extensive re-designing of equipment after it is put into use (25), but until this is done, it is hardly fair to attribute so many accidents to human failures.

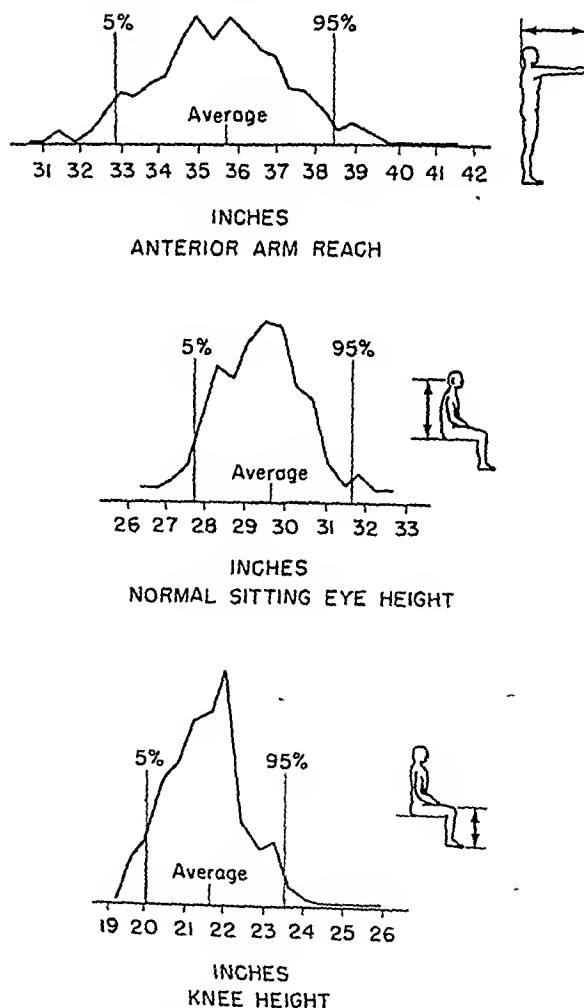
In general, any control lever that is unnecessarily difficult to reach and operate, any instrument that is difficult to read, any seat that induces poor posture or discomfort, or any unnecessary obstruction to vision may contribute directly to an accident. In addition, the cumulative effects of such difficulties lead to fatigue, to the deterioration of driver efficiency, and perhaps, eventually, to an accident (25, 26).

Numerous examples of faulty design in modern vehicles may be found from the standpoint of the range in body size of the drivers, the biomechanics of human movements and postures, and the characteristics and limits of human perception. A few examples are taken from a study at Harvard in which a number of current-model trucks were evaluated (19, 27). A common defect was insufficient range of adjustability in the seat, either horizontally or vertically. Again, important controls were often placed too far away. For example, in

one model only 5 percent of the drivers could reach and operate the handbrake from the normal driving position.

Clearances were frequently inadequate; in one model only the shortest 40 percent of drivers could get the knee under the steering wheel when raising the foot to the brake pedal. In another, this clearance was so small and the gear shift was so close to the steering wheel that the tallest 15 percent of drivers could not raise the foot to the brake pedal, by angling the knee out to the side of the wheel, without first shifting the gear lever away to the right. Figure 5 shows the distribution among truck and

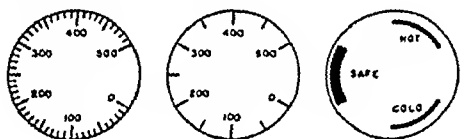
Figure 5. Variations among approximately 400 truck and bus drivers in body-size dimensions important in driving.



SOURCE: Reference 28.

bus drivers of three body dimensions important in driving, to illustrate the kind of information that may be used in designing to "fit" the drivers (28).

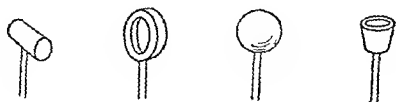
Inadequate vision from motor vehicles constituted a common problem, especially for the perception to the side and to the rear. Within the car or truck, instruments were frequently designed or placed so that they could not be read accurately and rapidly. Knobs and switches were sometimes identical in design and could not be distinguished from each other readily. Often they were so located that they could be operated inadvertently or by mistake. For example, a driver of one make of automobile had a serious accident while traveling at high speed during the night when he inadvertently shut off his headlights with the belief that he was pushing the knob for the cigarette lighter. Many examples illustrating such errors in design are found in the reports from studies carried out by the Harvard School of Public Health (19, 27, 28).



Baker and Grether (29) have demonstrated visually the principle of designing dials so that they can be read accurately and rapidly. Shown are 3 dials, 2 of which require the operator to interpolate between numbers on the scale. The third gives the necessary functional information at a glance.

Examples of the way in which knobs and handles can be shape coded to prevent the inadvertent operation of controls through mistaken identity have been developed by Jenkins and Sleight (30). Accurate visual discrimina-

Touch



Visual



tion can also be made when there is good color or contrast with the background.

Certain design features are especially important as causes of injuries to drivers and passengers in crashes. It is recognized that the crash and impact forces of a large proportion of fatal automobile accidents were actually within the body's physiological limits of survival, if the momentum of the body had been properly checked and the forces dissipated. A large-scale study of injury in relation to the structural features of cars and the circumstances is now based on the analysis of 8,000 cases per year (10). This study was initiated at the Cornell Medical College by the Commission on Accidental Trauma and has received substantial additional grants from two of the major automobile manufacturers.

An early finding in this study was that being ejected from the car considerably increases the possibility of injury or death. It was estimated that a reduction of 5,000 fatalities in the United States could be achieved each year by such means as improved door latches and the use of safety belts. Based on analyses of injuries sustained by 3,450 persons in 2,000 accidents, certain structures have been incriminated as important sources of injury to vehicle occupants. In addition to door latches that open and permit ejection, they are in descending order: the steering wheel and column, the instrument panel, windshield, top edge of front-seat back, door structures, and the lower part of the back of the front seat.

Another analysis in the Cornell study indicated that speed, when lower than 50 mph, is only partially correlated with the severity of injury. At the lower speeds especially, the design features in the car and the factor of ejection are of greater importance than the rate of travel at the time of the accident.

Transportation of Diseases

Another aspect of host-agent relationships is the spread of disease by various forms of transportation. Public health authorities recognize that certain diseases can be spread just as rapidly as the fastest means of transportation. However, many of the immigration, quarantine, and health regulations were adopted in reference to surface travel, and need

to be revised to keep pace with the modern airplane and the rapid transportation of persons from one part of the world to another (1).

The important implication of the speed of transit is that passengers can be conveyed from an infected to a noninfected area in less time than the incubation period of a disease, particularly by air transportation. Thus, infected travelers may directly expose other passengers and other persons prior to showing overt symptoms of disease, or bring a disease into an area which is free of the disease but contains a suitable vector. Also, there may be delay in proper treatment and appropriate preventive measures when the illness does become manifest because physicians in an area where it is not endemic may be unfamiliar with it (13).

There is also the possibility that insect vectors of disease may be carried to a noninfested area by aircraft. These insects may be merely transported and may spread disease by biting passengers during the flight. Or, escaping from aircraft after landing, they may become implanted in an area and produce new generations, creating a reservoir of infection. The possibility of transporting plant and animal diseases presents another important problem, held by some to be more serious than the threat to humans (31).

It had been predicted that diseases would be spread more easily with the advent of air transportation on a global basis. Thus far, however, there have been no major epidemics attributable to aviation. Contrary to the general impression, the epidemic of malaria in Natal, Brazil, in 1930 which later resulted in 100,000 cases was not introduced by aircraft. An evaluation of the time factors and the location of the original breeding sites at Natal in relation to the harbor and the airport led Soper to conclude that *Anopheles gambiae* was introduced, not by aircraft, but by the French destroyer making the mail run from Africa to Natal. Transportation by boat was also involved in the local epidemic of smallpox in the vicinity of Seattle in 1946 when a soldier returning from Japan came down with the disease while enroute and was hospitalized in that area (13).

Authenticated instances of the spread of disease through air transportation follow.

Toward the end of World War II, several

cases of smallpox were traced directly to a wounded soldier who arrived in San Francisco on a medical evacuation plane from Korea. He had apparently contracted the disease before enplaning and symptoms were not apparent on his arrival. Subsequently, approximately 100 cases developed in other parts of the west coast.

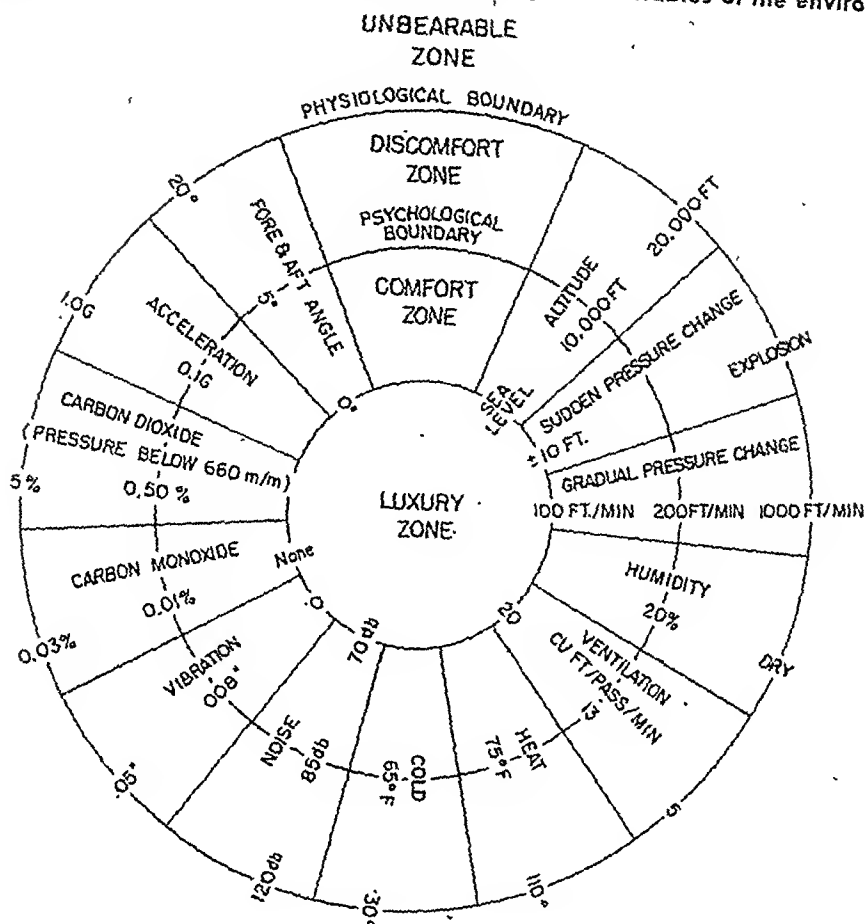
The so-called Arras epidemic of smallpox in 1946 in France was also traced to a soldier traveling by air. He had been stationed in Morocco and became ill during a flight to Italy, but he continued his journey to his home in Arras. He was not seen by a physician until 4 days had passed and was sent to a hospital with a diagnosis of chickenpox. Three days later the case was recognized to be smallpox, and in spite of revaccination of all known contacts a small epidemic followed, resulting in at least 1 death.

Another illustration concerns an outbreak of dengue fever in the Waikiki district of Honolulu in 1943. Several transport fliers arriving from the South Pacific had occupied an apartment in a Waikiki roominghouse. They had come through Suva in the Fiji Islands during an epidemic of dengue fever. Subsequently, the maids at this roominghouse became ill, and within a few weeks the Waikiki district became such a focus of infection that it was closed to military personnel until steps had been taken to virtually eliminate *Aedes* from the area.

An illustration of a potential epidemic is afforded by the case of a flight engineer who arrived in the eastern part of the United States 8 or 9 days after leaving a malarial area in Asia. He became ill shortly after arrival and was attended by a private physician who failed to recognize the disease, perhaps because of unfamiliarity with malaria. Two days later the airline's medical officer learned of the illness and had the patient hospitalized. Positive malarial smears were obtained, and despite intensive medical efforts the patient died from an overwhelming parasitemia of falciparum malaria approximately 13 or 14 days after infection. One may wonder how many more cases of malaria might have resulted if the appropriate mosquito vector, which is widespread in this country, had fed upon the patient (13).

The success of immunization procedures,

Figure 6. Comfort and tolerance limits for physical variables of the environment.



SOURCE: Reference 13.

modern methods for the disinsectization of aircraft, and other public health measures are responsible for holding the spread of disease to a very low incidence in air transportation. With these precautions it is possible that the threat of quarantinable and insectborne disease through air and surface transportation is of less importance to public health than such diseases as influenza and other virus infections. The proximity of passengers in closely confined quarters of an airplane cabin, bus, or railway car, especially when the air is recirculated, would facilitate the spread of airborne infections.

Host-Environment Relationships in Accidents

Many factors in the environment may influence the efficiency and safety of the operators of vehicles. Illumination, bad weather, and

toxic agents such as carbon monoxide are important in highway safety, while temperature, humidity, and ventilation are significant under extreme conditions. Noise and vibration are known to be excessive in certain types of highway vehicles. In aviation, the development of the pressurized cabin is of special interest since it affords an unusual illustration of the relationships between the host, the agent, and environmental factors affecting both health and safety.

Limits have been worked out for many of the environmental variables to show their influence on those who fly in air transports in terms of zones of comfort, discomfort, physiological harm, or intolerability. These are given schematically in figure 6. If the values in the innermost of the three concentric circles are adhered to, perfect comfort is assured. The second circle represents maximum limits for

comfort; hence if these values are exceeded discomfort will result. The outer circle presents values which would be physiologically harmful to the individual if they were reached or exceeded. While the chart has the advantage of brevity and clarity, it may be misleading if the values are accepted too rigidly, for many of them are interdependent. A comfort limit for noise, for example, is apt to be meaningless unless it is related to both frequency and duration. Similarly, the annoying features of vibration are functions of both the displacement amplitude and the frequency. The limits shown for carbon monoxide will be too high if persons are engaged in physical activity or are exposed to the gas while at high altitude (13, 31).

Efficiency of Vision

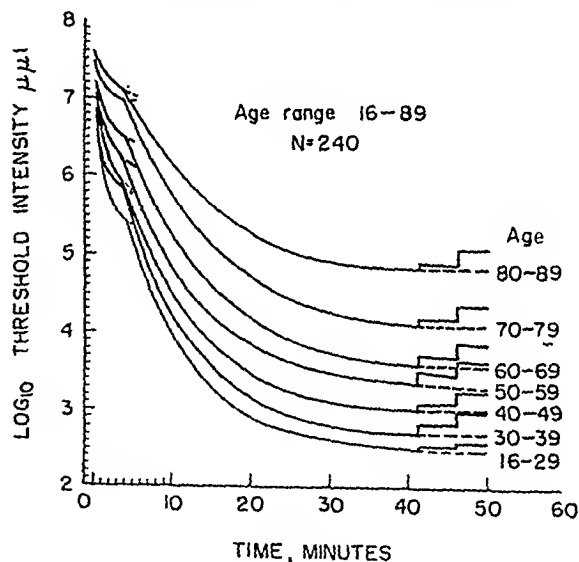
A significant factor in host-environment relationships is efficiency of vision. In the United States, accident rates per unit of travel are three times higher at night than during the day (7). Presumably, this is due partly to the lower visibility provided by night-time illumination, a contention supported by lower accident rates on lighted highways and by the reduction in rates following improvement of illumination on particular highways.

Older drivers are especially vulnerable in this connection, since the ability to see at low levels of illumination decreases regularly with increasing age. This effect is quite noticeable by middle age and becomes very marked in the elderly. We have calculated that for a dim light or object to be just seen by an eye in the dark, the illumination must be doubled for every increase of 13 years in age (32).

The use of tinted windshields by older drivers may present special hazards at night, since the glass further reduces visibility by reducing the intensity of light reaching the eye (10, 32). Figure 7 shows the increase in light for threshold perception as age increases. Slightly more intensity was needed at all ages when test lights were seen through ordinary clear windshield glass, which here is introduced at 41 minutes. When tinted glass is used, a larger increase in intensity is required. This illustrates in quantitative terms the importance of the interrelationship between factors relating to the host, the agent, and the environment.

Exposure to subclinical concentrations of carbon monoxide frequently leads to effects which may not be noticed by drivers. Even very small amounts of this gas breathed into the lungs are taken into the blood stream, resulting in some degree of oxygen deficiency in the tissues. Early symptoms are lowered alertness, difficulty in concentration, slight muscular incoordination, and a mental and physical lethargy. Reduction of night vision can be demonstrated as one of the first effects (13). These initial symptoms are not permanently injurious, but owing to their nature, they may easily cause hazardous situations. Although, in general, exhaust systems have been improved to prevent the leakage of fumes, appreciable

Figure 7. A comparison of the average dark adaptation curves for eight age groups, each curve indicating the greater sensitivity of the retina as it becomes adapted to darkness.



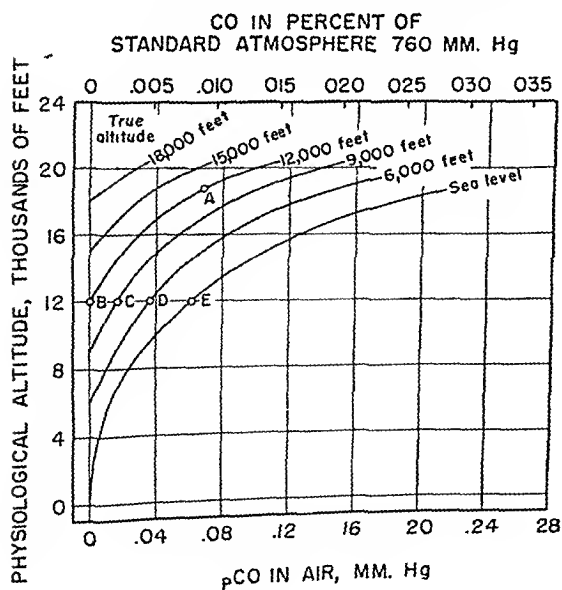
SOURCE: References 10 and 32.

NOTE: The first 4 or 5 minutes are concerned with cone vision; the remainder of the curve shows the adaptation of the rods. The vertical separation of the curves indicates the increase in intensity of light required for threshold perception (scale at left) as a function of increasing age. Also shown are the slight increase in intensity required when lights are viewed through clear windshield glass (at 41 minutes) and the relatively large increase in illumination needed when tinted windshield glass is placed before the dark-adapted eye (46 minutes). The latter effect may be somewhat more pronounced in the older groups.

concentrations of this gas have been found in the passenger compartment when the car stands with motor idling or moves slowly in dense traffic. Drivers should be well indoctrinated on the need for flushing vehicles with fresh air in such circumstances.

In addition, drivers and airmen should know that certain conditions will intensify the effect of carbon monoxide from engine exhaust (13). For example, the effect of carbon monoxide is obviously more pronounced the higher the altitude. If the blood of a chronic smoker at sea level already contains 5 to 7 percent carbon monoxide absorbed from tobacco smoke, he is affected as if he were a nonsmoker at an altitude of 7,000 or 8,000 feet. Figure 8 shows the combined effect of carbon monoxide and altitude as expressed in terms of the altitude producing an equivalent degree of anoxia. Thus, a person at sea level exposed to air with a partial pressure of 0.06 carbon monoxide would be affected to the same extent as if he were breathing uncontaminated air at 12,000 feet (31). If other oxygenation-reducing factors are present, such as the use of alcohol or certain medicines (sulfanilamide, barbiturate, or acetanilid, for example), the various factors may

Figure 8. The combined effect of carbon monoxide and altitude expressed as altitude producing an equivalent degree of anoxia.



SOURCE: Reference 31.

combine in their effects, resulting in a significant state of oxygen deficiency seriously jeopardizing safety (8).

Air Transportation of Patients

Patients are using air travel more and more because they can be transported to treatment and surgical centers rapidly.

The Flying Doctors Service of Australia, inaugurated in 1928, clearly demonstrated that the airplane provides an unusually effective way of transporting patients. During World War II the advantage of air travel for the sick and injured was dramatically demonstrated. Only 46 deaths occurred in flight in approximately 1,260,000 patient flights by the U. S. Air Force from all military theaters in the period January 1943 to April 1947.

A study has been made of the passenger deaths in the scheduled airlines of this country from 1930 to 1956. An extremely low rate, less than 1 death per million revenue passengers, has been found consistently. In 1955, for example, there were 22 in-flight deaths in 38 million revenue passengers, or a rate of 0.6 per million (13). Instances of loss of consciousness in flight (table 3) have also been found to be infrequent in comparison with the volume of traffic (33).

The chief precautionary measures for patients undertaking travel by air relate to (a) possible interference with the availability of oxygen and (b) the mechanical effects of the expansion of internal gases. If a physician understands the basic physiological principles involved, appropriate decisions can be made in regard to the advisability of air travel by individual patients (13).

Certain conditions may be characterized by a lowered oxygen saturation of the blood, or a limitation on the transport or utilization of oxygen when the body is placed under stress. Flight may thus be contraindicated or undertaken with caution by patients with certain forms of cardiovascular disease, pulmonary disease, anemia, diabetes, and overwhelming infections or shock, because of additional hypoxia due to altitude.

Among patients with cardiovascular diseases, flight may most frequently be contraindicated for those having limited cardiac reserve, or re-

Table 3. Instances of unconsciousness during flight in United States scheduled airlines, 1947-55, by associated condition and altitude

| Associated condition | Persons losing consciousness | Altitude (unpressurized flight) | | Cabin pressurized | Altitude or pressurization unknown |
|--|------------------------------|---------------------------------|------------------|-------------------|------------------------------------|
| | | 0-8,000 feet | Above 8,000 feet | | |
| Cardiovascular disease..... | 80 | 19 | 25 | 22 | 14 |
| Epilepsy, seizures, and convulsions..... | 75 | 16 | 14 | 29 | 16 |
| Fatigue..... | 42 | 8 | 10 | 16 | 8 |
| Motion sickness..... | 41 | 23 | 2 | 9 | 7 |
| Apparent hypoxia..... | 17 | 2 | 9 | 16 | 0 |
| Other and unknown..... | 492 | 112 | 114 | 170 | 96 |
| Total..... | 747 | 180 | 174 | 252 | 141 |

¹ Includes 4 instances following accidental decompression.

SOURCE: Reference 33.

cent myocardial infarction. Such patients are already under stress to compensate for an insufficient supply of oxygen in heart muscle or are receiving only a marginal supply of oxygenated blood through the general circulation. Experience has shown, however, that altitude is probably not a critical factor for the cardiac patient unless either the disease or the exposure is severe. While those with a history of severe valvular disease, recent coronary thrombosis, or easily provoked angina probably should not fly, individuals with well-compensated heart diseases need not hesitate to fly at moderate altitudes, particularly if cabins are pressurized to about 6,000 feet, or if oxygen is available at all altitudes.

In some pulmonary conditions such as pneumonia, emphysema, and severe asthma, there may be preexisting oxygen want due to mechanical interference with the diffusion of oxygen into the blood in the lungs. In bronchial asthma there may also be oxygen want due to spasm of the smooth muscles of the finer bronchioles. With respiratory embarrassment as well, the individual severely ill with this condition will be unable to cope with the additional hypoxia of even moderate altitudes. The average asthmatic without emphysema, however, is not likely to be affected adversely by altitude.

Serious consequences may result if an anemic person flies at high altitude, and a patient with anemia of even moderate degree might be expected to react poorly to hypoxia because of the

impairment in the oxygen transport system of the blood. Transfusion before flight would be required by many with anemia or leukemia, and oxygen should be supplied from the ground up to patients with those conditions.

Air travel is not contraindicated for diabetics who are fully stabilized and can follow their time schedules for insulin and meals conscientiously. Difficulties may arise from either insulin reaction or diabetic coma. The effects of oxygen want are greatly accentuated when accompanied by low blood sugar, and the reaction may be more severe if fluid and food are lost by the patient because of air sickness.

Certain upper respiratory and thoracic abnormalities and abdominal and neurological conditions may be adversely influenced by the mechanical effects of the expansion of internal gases incident to the decreased barometric pressure at high altitude.

Sinus or otic barotrauma may result in persons with upper respiratory or middle ear disorders since such patients may experience difficulty in equalizing internal and external pressures, particularly during descents. If it is necessary to fly during an acute inflammatory phase, the use of vasoconstrictor drugs is indicated to secure adequate ventilation of the sinuses and middle ear to prevent damage and spread of infection.

One of the most serious contraindications to flight is the presence of pneumothorax. Several deaths in air travel have been traced to the

expansion of a large amount of encapsulated air in pneumothorax patients. If there is free air in the thoracic cavity, the expansion of this air may not only collapse the lung but may also displace the mediastinum, affecting other organs. Tidal air volume is also reduced. The various factors that affect the maximum safe altitude must be calculated for each person on each occasion when he travels. If flight is necessary, it is unwise to start immediately after a refill, and it may be advisable to aspirate the air from the pleural cavity to compensate for the decreased atmospheric pressure during flight.

The expansion of gases trapped in viscera and the abdominal cavity is the basis for contraindicating air travel for about 10 days after persons have undergone extensive abdominal surgery. Intestinal obstruction from any cause presents a serious problem, and if a patient must be transported, procedures to reduce accumulated gases should be followed. Perforated ulcer of the stomach and perforation of the bowel are other conditions that would contraindicate flight at any but low altitudes.

While the hazards of air travel in regard to neurological ailments have been least well defined, difficulties might be expected in patients (a) with air injected for diagnostic purposes, (b) with cranial injuries such that there may be herniation of the brain through openings in the skull, and (c) with conditions in which there may be an increase in intracranial or intraspinal pressures. Marked decreases in atmospheric pressure might be expected to affect such patients adversely. Experience suggests that routine flying as a passenger is not contraindicated for the epileptic whose seizures are controlled by drugs, and there is little indication that blood changes encountered in flight up to 10,000 to 12,000 feet are sufficient to induce seizures.

Effects of Loss of Pressure in Flight

After a sudden decompression at high altitude, passengers would be exposed to severe cold, and a few might develop "bends" if the plane were unable to descend to low altitude within a short time. The low tension of oxygen in the air at high altitude, however, is a limiting factor with the far more serious im-

plications of acute oxygen want. At 40,000 feet, for example, useful consciousness is retained for only 30 to 40 seconds. Even at 25,000 feet most persons would lose consciousness if exposed for 1½ to 2½ minutes unless supplementary oxygen were available (13).

Rapid decompressions have occurred in civil air transportation of the United States at a rate of about 1 incident in 100,000 hours of flying. Fortunately, most of these incidents so far have occurred below 25,000 feet, and planes have been able to descend to low altitudes immediately in almost all instances. In several it was necessary to provide oxygen to passengers showing signs of distress, and at least four instances of loss of consciousness have been reported. It is obvious that a decompression at 40,000 feet would present a very serious problem, and additional precautions will be necessary in the new jet transport equipment designed to operate at 35,000 to 40,000 feet. Unless cabin structures and pressurization are made completely foolproof and as reliable as any major component of the aircraft, it will be necessary to carry emergency oxygen equipment for all on board (34).

Conclusions

Accidents now rank above disease as the chief cause of death and disability to many segments of our population, and now constitute a major threat to the well-being and health of our people.

The accepted function of medicine has been the treatment of disease and injury. Just as the province of medicine has been extended to include the prevention of disease, it is proposed that the prevention of accidental trauma should be a responsibility of preventive medicine and public health.

When accidental trauma is considered a non-contagious mass disease of epidemic proportions, the epidemiological approach should be applied to the study and control of injuries since similar biological principles are involved. An interdisciplinary approach is a basic requirement in this because multiple causation is found in most accidents.

The causes of accidents may be identified in the interactions between the host, the agent (or

equipment), and variables of the environment. Human factors are especially important, and the physician can contribute effectively in the analysis of accident causes because of his background in the biological sciences and his knowledge of human behavior. He can indoctrinate his patients and teach while treating.

Factors of significance to the host in the control of accidental trauma include not only those which determine suitability for a given task such as driving a vehicle or piloting a plane, but also such factors as age, training, and, particularly, personal adjustments. The most promising approach to identifying the accident repeater is based on the concept that "a man works, or drives, as he lives."

The control of various temporary host factors such as fatigue, emotional problems, effects of alcohol, and the influence of disease is highly important. Periodic medical examinations and adequate programs of health maintenance can play a significant role in improving safety both in land and air transportation.

Biotechnology and human engineering should be applied to the design of equipment in order to achieve a closer integration between the operator and his equipment.

The agent of disease also is significant in modern transportation, since insect vectors of disease might be transported in planes and other vehicles and since long journeys may now be completed within the incubation period of most contagious diseases. A review of epidemics attributable to transportation indicates that thus far the spread of disease through air transportation has been less than predicted but that the constant threat to public health must be continually controlled.

Host-environment relationships also have implications for safety in transportation because of the influence upon the individual of physical variables such as the level of illumination, the temperature and humidity, and exposure to carbon monoxide and other toxic agents. Data have been worked out for each of these variables outlining the zones of comfort and discomfort and the ranges where human performance is adversely influenced.

In air transportation, the low tension of oxygen at high altitudes and decrease in barometric pressure with altitude are significant not only

for their influence on the performance of airmen, but also because of their implications for the safety of travel by air by persons who are physically unfit or who are afflicted with certain diseases or physical conditions. These same factors are of critical importance in the development of equipment to transport passengers at very high altitudes because of their significance in the case of a sudden loss of pressurization.

In conclusion, the physician or the public health officer has a direct responsibility for the prevention of accidental trauma. He may contribute most effectively by his aid in carrying out controlled experimental and clinical studies, epidemiological surveys, and by collaborating with specialists in other biological sciences, engineers, and administrative officers in a combined approach to this problem.

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1957 Summary of Disease Outbreaks

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THE NUMBER of disease outbreaks reported in 1957 for which either water or food was the vehicle of infection was essentially the same as in the past few years (table 1). The number of outbreaks reported by the various States apparently bore no direct relationship to the size of their populations but reflected the extent of activities in investigating epidemic occurrences. The number for a few States was relatively large because of the inclusion of outbreaks occurring on military installations located within their borders.

The method used to tabulate outbreaks was changed slightly from that used in previous summaries. Only those outbreaks with laboratory confirmation of a specific type of food poisoning or food infection were placed in definite categories such as salmonellosis, shigellosis, or staphylococcal food poisoning (table 2). Those without such confirmation were classed as gastroenteritis, etiology unknown. This change accounts largely for the sizable reduction of outbreaks attributed to staphylococcal food poisoning, approximately 50 percent compared with the years 1955 and 1956, when many outbreaks were classified according to clinical and epidemiological findings.

In addition to the usual method of tabulating the number of various types of outbreaks by States, each of the principal types of foodborne outbreaks was tabulated by kind of food involved and by either the place of occurrence or the source of food. As shown in table 3, poultry and other meats were associated with a large proportion of these occurrences. It is also apparent that a large proportion occurred in

groups of persons eating in public establishments and in private homes. However, the average number of persons per outbreak was relatively small as compared with the number in outbreaks occurring in schools or institutions and at social gatherings such as picnics and church gatherings.

No improvements in food-handling practices are apparent. Lack of refrigeration, exposure at room temperatures, or handling of food by persons with infections were mentioned frequently as contributing to or as the direct cause of the outbreak.

Waterborne Outbreaks

Comparatively few outbreaks occurred in 1957 for which water was demonstrated to be the vehicle of infection. In one instance, two persons with typhoid fever had used water from a dug well which presumably was contaminated by a chronic carrier who lived nearby. Gastroenteritis of unknown etiology occurred in two groups of individuals using water from wells that showed evidence of fecal contamination. One small group of cases of gastroenteritis occurred among passengers on an airplane. Inspection of the plane's drinking water supply suggested that it was the probable source of the illness.

Milkborne Outbreaks

Market milk was not reported as the source of infection in any outbreak of disease in 1957. However, two cases of brucellosis were found in one family in which raw milk had been used for a period of about 2 years. A case of Q fever was found in an individual who consumed raw

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milk during a milk strike. Some of the cows in the dairy supplying the milk were shown by laboratory tests to be infected with Q fever.

Milk products, mainly ice cream, were vehicles of infection in six outbreaks. Three of the five involving ice cream were caused by *Salmonella*. Since raw eggs were used in preparing the ice cream in two of these outbreaks, it is possible that they were the primary source of infection. In one instance, cream cheese served in a restaurant was thought to be the probable source of infection for a small group of persons with gastroenteritis.

Typhoid Fever

Only four outbreaks of typhoid fever were reported in which either food or water was definitely incriminated. Two cases occurred among workmen of a small factory supplied with drinking water from a dug well. The well probably was contaminated from a nearby cesspool receiving the stools of a known carrier. An explosive outbreak totaling 38 confirmed and 27 suspect cases of typhoid fever occurred in an institution. The outbreak was considered to be foodborne since the water supply was found satisfactory in every respect. One of the persons living in the institution was found to be a carrier. It was determined that she carried the same phage type (E_1) organism that was found in a number of the cases. In another outbreak of 17 cases, 14 were confirmed by isolation of a phage type (E_1) organism. All of the patients were members of the 7th grade of a public school. The manager of the cafeteria in the school was found to be a carrier and is presumed to be the source of infection, but the mode of contamination or the specific food involved was not determined. In another instance of 13 cases all of the patients had eaten in a restaurant where a carrier, not previously known, was employed as a busboy.

A group of three cases, not included in the tables, occurred in preschool children living in the same apartment building. A known carrier lived in this building, and another lived in another part of the housing development, but neither had any known contact with the

children. The organisms recovered from the first carrier and the children were all shown

Table 1. Foodborne and waterborne disease outbreaks reported in 1957, by vehicle of infection

| Area | Water | | Milk and milk products ¹ | | Other foods ¹ | |
|---------------------|-----------|-------|-------------------------------------|-------|--------------------------|--------|
| | Outbreaks | Cases | Outbreaks | Cases | Outbreaks | Cases |
| United States | 4 | 131 | 8 | 67 | 250 | 11,085 |
| New England: | | | | | | |
| Maine | | | | | 5 | 49 |
| Massachusetts | | | | | 7 | 383 |
| Rhode Island | | | | | 3 | 66 |
| Connecticut | 1 | 25 | | | 3 | 38 |
| Middle Atlantic: | | | | | | |
| New York | 1 | 2 | 1 | 5 | 18 | 936 |
| New Jersey | | | 1 | 1 | 5 | 424 |
| Pennsylvania | | | | | 1 | 17 |
| East North Central: | | | | | | |
| Ohio | | | | | 2 | 42 |
| Indiana | | | | | 2 | 338 |
| Illinois | 1 | 100 | 1 | 16 | 14 | 317 |
| Michigan | | | | | 2 | 104 |
| Wisconsin | | | | | 3 | 115 |
| West North Central: | | | | | | |
| Minnesota | | | | | 4 | 109 |
| Iowa | | | | | 2 | 20 |
| Missouri | | | | | 3 | 279 |
| North Dakota | | | | | 1 | 32 |
| Nebraska | | | | | 5 | 1,394 |
| South Atlantic: | | | | | | |
| Maryland | | | | | 12 | 1,034 |
| Virginia | | | | | 6 | 237 |
| West Virginia | | | | | 1 | 100 |
| North Carolina | | | 1 | 6 | 3 | 177 |
| South Carolina | | | | | 2 | 75 |
| Georgia | | | | | 3 | 135 |
| Florida | | | | | 2 | 55 |
| East South Central: | | | | | | |
| Kentucky | | | 1 | 2 | 5 | 60 |
| Tennessee | | | 1 | 19 | 4 | 233 |
| Alabama | | | | | 2 | 222 |
| West South Central: | | | | | | |
| Arkansas | | | 1 | 16 | 2 | 36 |
| Louisiana | | | | | 5 | 1,232 |
| Mountain: | | | | | | |
| Wyoming | | | | | 1 | 4 |
| Colorado | 1 | 4 | | | 1 | 1 |
| New Mexico | | | | | 2 | 12 |
| Arizona | | | | | 2 | 165 |
| Pacific: | | | | | | |
| Washington | | | | | 5 | 88 |
| Oregon | | | | | 4 | 137 |
| California | | | 1 | 2 | 106 | 2,404 |
| Hawaii | | | | | 1 | 6 |
| Not known | | | | | 1 | 9 |
| United States 1956 | 9 | 1,719 | 31 | 873 | 210 | 11,133 |
| United States 1955 | 2 | 22 | 3 | 302 | 193 | 9,633 |

¹ Includes outbreaks among military personnel

Table 2. Foodborne, waterborne, and other disease outbreaks reported in 1957, by type of infection

| Area | Typhoid fever | | Salmonellosis ¹ | | Shigellosis | | Trichinosis | | Botulism | | Staphylococcal food poisoning ¹ | | Streptococcal infections | | Gastroenteritis, etiology unknown ¹ | | Toxic agents | |
|-------------------------|---------------|-------|----------------------------|-------|-------------|-------|-------------|-------|-----------|-------|--|-------|--------------------------|-------|--|-------|--------------|-------|
| | Outbreaks | Cases | Outbreaks | Cases | Outbreaks | Cases | Outbreaks | Cases | Outbreaks | Cases | Outbreaks | Cases | Outbreaks | Cases | Outbreaks | Cases | Outbreaks | Cases |
| United States..... | 4 | 70 | 30 | 1,607 | 11 | 754 | 1 | 14 | 6 | 12 | 58 | 1,660 | 4 | 1,030 | 135 | 6,065 | 8 | 68 |
| New England: | | | | | | | | | | | | | | | | | | |
| Maine..... | | | 2 | 8 | | | | | | | 2 | 26 | | | 1 | 15 | | |
| Massachusetts..... | | | | | | | | | | | 2 | 110 | | | 5 | 273 | | |
| Rhode Island..... | | | | | | | | | | | 2 | 34 | | | 1 | 32 | | |
| Connecticut..... | | | | | | | | | | | 3 | 38 | | | 1 | 25 | | |
| Middle Atlantic: | | | | | | | | | | | | | | | | | | |
| New York..... | 1 | 2 | 2 | 132 | 1 | 200 | 1 | 4 | | | 6 | 124 | | | 7 | 478 | 2 | 3 |
| New Jersey..... | | | 1 | 176 | | | | | 1 | 1 | | | | | 3 | 247 | | |
| Pennsylvania..... | 1 | 17 | | | | | | | | | | | | | | | | |
| East North Central: | | | | | | | | | | | | | | | | | | |
| Ohio..... | | | 1 | 12 | | | | | | | | | | | | | 1 | 30 |
| Indiana..... | 1 | 38 | | | | | | | | | | | 1 | 300 | | | | |
| Illinois..... | | | 1 | 7 | | | | | | | 4 | 67 | | | 11 | 359 | | |
| Michigan..... | | | | | | | | | | | 1 | 85 | | | 1 | 19 | | |
| Wisconsin..... | | | | | | | | | | | | | | | 3 | 115 | | |
| West North Central: | | | | | | | | | | | | | | | | | | |
| Minnesota..... | | | 1 | 45 | 1 | 11 | | | | | 1 | 10 | | | 1 | 43 | | |
| Iowa..... | | | | | | | | | | | 1 | 3 | | | 1 | 17 | | |
| Missouri..... | | | | | | | | | | | 3 | 279 | | | | | | |
| North Dakota..... | | | | | | | | | | | | | | | 1 | 32 | | |
| Nebraska..... | | | | | | | | | | | | | | | 5 | 1,394 | | |
| South Atlantic: | | | | | | | | | | | | | | | | | | |
| Maryland..... | | | 1 | 20 | | | | | 1 | 2 | 2 | 52 | 1 | 600 | 7 | 360 | | |
| Virginia..... | | | | | 2 | 90 | | | | | | | | | 3 | 131 | 1 | 16 |
| West Virginia..... | | | | | | | | | | | | | 1 | 100 | | | | |
| North Carolina..... | | | 2 | 20 | | | | | | | 1 | 150 | | | 1 | 13 | | |
| South Carolina..... | | | 1 | 39 | | | | | | | | | | | 1 | 36 | | |
| Georgia..... | | | | | | | | | | | 1 | 66 | | | 2 | 69 | | |
| Florida..... | | | | | 1 | 50 | | | | | | | | | 1 | 5 | | |
| East South Central: | | | | | | | | | | | | | | | | | | |
| Kentucky..... | | | | | | | | | | | 2 | 13 | | | 4 | 49 | | |
| Tennessee..... | | | 1 | 19 | | | | | | | 1 | 69 | | | 3 | 164 | | |
| Alabama..... | | | | | 1 | 192 | | | | | | | | | 1 | 30 | | |
| West South Central: | | | | | | | | | | | | | | | | | | |
| Arkansas..... | | | 1 | 16 | | | | | | | | | | | 2 | 36 | | |
| Louisiana..... | | | 1 | 423 | | | | | | | | | | | 3 | 806 | 1 | 3 |
| Mountain: | | | | | | | | | | | | | | | | | | |
| Wyoming..... | | | | | | | 1 | 4 | | | | | | | | | | |
| Colorado..... | | | | | | | | | 1 | 1 | | | | | | | | |
| New Mexico..... | | | 1 | 11 | | | | | 1 | 1 | | | | | 1 | 4 | | |
| Arizona..... | | | | | | | | | | | 2 | 165 | | | | | | |
| Pacific: | | | | | | | | | | | | | | | | | | |
| Washington..... | | | | | 1 | 41 | | | 1 | 5 | 1 | 3 | | | 2 | 39 | | |
| Oregon..... | | | | | | | | | | | 1 | 3 | | | 3 | 134 | | |
| California..... | 1 | 13 | 14 | 679 | 4 | 170 | | | 1 | 2 | 21 | 354 | 1 | 30 | 60 | 1,140 | 3 | 16 |
| Hawaii..... | | | | | | | 1 | 6 | | | | | | | | | | |
| Unknown..... | | | | | | | | | | | 1 | 9 | | | | | | |
| United States 1956..... | 7 | 52 | 23 | 1,999 | 8 | 1,107 | 11 | 98 | 11 | 22 | 111 | 4,313 | | | 88 | 6,688 | 9 | 160 |
| United States 1955..... | 5 | 36 | 16 | 971 | 10 | 475 | 5 | 92 | 5 | 14 | 102 | 4,130 | | | 66 | 5,160 | 5 | 99 |

¹ Includes outbreaks among military personnel.

to be phage type E₁. Overflow of sewage from the building into the basement was pumped out on a lawn used by the children as a play area. It is possible that the children were infected on the playground. In another area, floods occurring in late spring washed out sewer mains and covered the sewage treatment plant of a large city. Seven cases are believed to have resulted directly or indirectly from this interruption of sewage disposal. One case in the same city was considered to have resulted from a fall into the river when it was highly polluted with sewage.

Salmonellosis

Thirty outbreaks of salmonellosis were reported in 1957, all of which were confirmed by

recovery of organisms either from the stools of those who were ill, from food handlers, or from specimens of food. In six of the outbreaks, poultry meat—usually turkey—was eaten. A comparatively large number of the outbreaks occurred in homes. The smallest consisted of 3 cases and the largest of 70 cases following a wedding reception at which turkey was served. One large outbreak occurred simultaneously among persons attending dinners in several churches of one community. The food served by a single caterer from another State was transported about 400 miles in this outbreak.

Fifteen types of *Salmonella* organisms were isolated in the 30 outbreaks. Among the types recovered were *S. typhimurium* in 11, *S. newport* in 4, *S. montevideo* and *S. tennessee* in 2

Table 3. Outbreaks of certain foodborne diseases reported in 1957, by type and source of food

| Source | Salmonellosis | | Shigellosis | | Staphylococcal food poisoning | | Streptococcal infections | | Gastroenteritis, etiology unknown | |
|-----------------------------------|---------------------|----------------------------|---------------------|----------------------------|-------------------------------|----------------------------|--------------------------|----------------------------|-----------------------------------|----------------------------|
| | Number of outbreaks | Number of persons affected | Number of outbreaks | Number of persons affected | Number of outbreaks | Number of persons affected | Number of outbreaks | Number of persons affected | Number of outbreaks | Number of persons affected |
| Type of food | | | | | | | | | | |
| Poultry..... | 6 | 464 | 1 | 50 | 10 | 340 | 1 | 30 | 18 | 1,188 |
| Other meat..... | 2 | 21 | 1 | 3 | 21 | 519 | 0 | ----- | 41 | 1,496 |
| Custard-filled dessert..... | 2 | 23 | 0 | ----- | 10 | 167 | 0 | ----- | 12 | 186 |
| Salad..... | 3 | 105 | 1 | 192 | 2 | 36 | 2 | 900 | 7 | 456 |
| Other..... | 7 | 135 | 1 | 12 | 10 | 231 | 1 | 100 | 12 | 106 |
| Not determined..... | 10 | 859 | 7 | 497 | 5 | 367 | 0 | ----- | 42 | 2,503 |
| Total..... | 30 | 1,607 | 11 | 754 | 58 | 1,660 | 4 | 1,030 | 132 | 5,935 |
| Source of food | | | | | | | | | | |
| Public eating establishments..... | 5 | 274 | 3 | 73 | 10 | 111 | 0 | ----- | 39 | 421 |
| Private clubs..... | 5 | 498 | 0 | ----- | 4 | 147 | 1 | 100 | 5 | 179 |
| Schools..... | 0 | ----- | 2 | 289 | 5 | 158 | 0 | ----- | 8 | 897 |
| Colleges..... | 0 | ----- | 1 | 79 | 1 | 7 | 0 | ----- | 3 | 617 |
| Hospitals and institutions..... | 3 | 38 | 2 | 91 | 2 | 41 | 0 | ----- | 3 | 700 |
| Recreation camps..... | 0 | ----- | 0 | ----- | 2 | 96 | 0 | ----- | 4 | 154 |
| Labor camps..... | 0 | ----- | 0 | ----- | 3 | 161 | 0 | ----- | 7 | 213 |
| Social gatherings..... | 2 | 508 | 0 | ----- | 7 | 337 | 3 | 930 | 11 | 1,230 |
| Bakery caterers..... | 1 | 3 | 0 | ----- | 11 | 111 | 0 | ----- | 5 | 97 |
| Private homes..... | 12 | 233 | 2 | 22 | 9 | 63 | 0 | ----- | 23 | 181 |
| Transportation..... | 1 | 14 | 0 | ----- | 0 | ----- | 0 | ----- | 3 | 89 |
| Other..... | 1 | 39 | 1 | 200 | 4 | 425 | 0 | ----- | 21 | 1,127 |
| Total..... | 30 | 1,607 | 11 | 754 | 58 | 1,660 | 4 | 1,030 | 132 | 5,935 |

each. In one outbreak 2 types, *S. give* and *S. sandiego*, were recovered; in another, 3 types, *S. barielly*, *S. monteideo*, and *S. reading*.

Early in 1957 it was noticed that an unusual number of *S. reading* infections were occurring. A sharp rise in the number began in September 1956 and reached a peak of 71 cases in February 1957. Infections were identified almost simultaneously in several widely separated areas of the country. During the 12-month period beginning in September 1956, there were 325 acute, sporadic cases and 3 outbreaks due to this type of organism. Previously *S. reading* was very rarely identified among the *Salmonella* isolates from human or animal infections occurring in the United States. Of the cases reported, 70 percent were in children 6 years of age or under and 18 percent in children under 1 year. The epidemiological picture strongly suggested a widely distributed common source of infection, but despite intensive investigation by means of detailed food histories, no common vehicle was identified.

Shigellosis

Eleven outbreaks of shigellosis were reported in 1957. Water was not regarded as the vehicle in any of them. As shown in table 3, three of them involved eating in public eating places, two occurred in institutions, and two in schools. The food involved in transmission of the infection was not determined in 7 of the 11 outbreaks. *Shigella sonnei* was recovered in 2 outbreaks, *Shigella flexneri* in 4, and the species was not stated in the remaining 5.

Trichinosis

Three relatively small outbreaks of trichinosis were reported in 1957. In one family outbreak comprising 4 cases, sausage or chopped beef that may have been contaminated in a meat grinder was the probable source of infection. Four other cases, proved by biopsy, followed consumption of homemade garlic sausage. Consumption of raw pork and liver preceded acute trichinosis in 6 patients, 3 of whom died. Numerous trichina larvae were found at autopsy of two and by muscle biopsy

in others. Calcified cysts indicating previous infestations were found in some of the specimens. Specimens from a slaughtered pig also showed numerous trichina larvae.

Botulism

Six separate reports of botulism afflicting 12 persons were reported in 1957. Home-canned foods had been eaten in each instance. These included a gluten preparation, sausage, mushrooms, stringbeans, corn, and tuna fish. The type of infection was reported in only one instance, type A botulinus toxin being found in the tuna fish. Four of the 12 persons with botulism died.

Staphylococcal Food Poisoning

Most of the 58 outbreaks of staphylococcal food poisoning reported occurred in groups of persons who had eaten in public establishments or in private homes, or had consumed food obtained from bakeries and caterers. Poultry and other meats were most commonly associated with these outbreaks. Eclairs and custard-filled cakes and pies were proved by laboratory tests to be the vehicles of infection in only 10 outbreaks. These types of food were suspected in 12 additional episodes, but the cases were tabulated as gastroenteritis, etiology unknown, because laboratory confirmation was not obtained.

Streptococcal Infections

Four relatively large epidemics of streptococcal infection were traced to food eaten at social gatherings. In one instance, it was estimated that about two-thirds of the 900 who attended a charity luncheon became ill with septic sore throat. Egg salad served at the luncheon was considered to be the vehicle of infection. In another epidemic which occurred among those attending a social, the potato salad was found to contain large numbers of streptococci. Symptoms of gastroenteritis characterized the illness. Thirty persons became ill with cramps and diarrhea following a church picnic where chicken salad was served. This food contained streptococci. Following a school picnic in another area, large numbers of strepto-

cocci were found in meat loaf, potato salad, and coleslaw served to the children, 100 of whom developed gastroenteritis.

Gastroenteritis, Etiology Unknown

The number of reported outbreaks with unknown etiology constituted more than half of the total of foodborne and waterborne outbreaks. In about 45 percent of them, poultry and other meats were considered the vehicles of infection. About the same percentage occurred in persons eating in public eating establishments and in private homes. In most of the 132 foodborne outbreaks, investigators were unable to obtain specimens of food for laboratory testing. In a small number, specimens were obtained but showed none of the organisms usually associated etiologically with food infection or food poisoning.

Chemical Poisoning and Noxious Foods

In one of the four reports of chemical poisoning, 3 persons showed clinical signs of acute lead poisoning. They had cramps and diar-

rhea and complained of a metallic taste after eating duck meat. The ducks had been shot and stored in a freezer for 2 months. A laboratory test showed the presence of lead in leftover portions of the duck meat. In another outbreak, lemonade prepared in a cadmium-lined can produced illness in every person who drank it at a school picnic. The lemonade contained 62.7 ppm of cadmium, and vomitus from patients contained 15.0 ppm of the metal. A case of poisoning occurred in one child who ate chocolate-covered ice cream, on a stick. A washing powder, sodium metasilicate, may have spilled into the molds used in making the ice cream sticks, or it may have remained in the molds after cleaning. In another instance, 16 persons became ill shortly after eating breakfast on an excursion boat. The type and source of toxic agent could not be determined.

In four outbreaks reported, ingested foods produced toxic symptoms. In two instances, mushrooms were eaten. Castor beans caused illness in another. Consumption of smoked fish was reported as the probable cause of acute toxic symptoms in six persons.

Conference on Staphylococcal Infections

A conference on staphylococcal infections will be held at the Communicable Disease Center of the Public Health Service in Atlanta, Ga., September 15-17, 1958.

Representatives of 40 hospital, medical, and other professional organizations will confer on control measures that can be established in hospitals and communities to deal with the mounting problem of infections caused by bacteria which are resistant to penicillin and other antibiotic drugs.

The conference, recommended by the American Hospital Association, will be sponsored by the National Research Council and the Public Health Service.

In comparison with other members of HIP, those over 65 have a higher rate of physician visits. Greater use of services from both specialists and family physicians and more visits in the hospital account for the differences.

Experience With Older Members in a Prepaid Medical Care Plan

SAM SHAPIRO, B.S., and MARILYN EINHORN, A.B.

VOLUNTARY health insurance for older people (those 65 years and over) has expanded in recent years but still lags behind coverage for the population of the United States as a whole. It is estimated that in 1955 about 65 percent of the total population had some type of health insurance (1), while only about 41 percent of the noninstitutionalized aged were covered (2).

Reduced incomes, retirement, and enrollment restrictions are among the reasons why most of the aged do not have health insurance. Also contributing is the fact that when many of today's older people were in the labor force health insurance was not so widespread as it is now.

The need for finding ways to extend the benefits of voluntary health insurance to more of the aged is generally recognized as acute and is receiving attention by government, employer and union groups, and the prepayment plans (2).

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Necessary in considering solutions to this problem is information regarding requirements and expenditures for medical care of the aged. In the last few years, this type of information has expanded significantly through studies of general population groups (3). An item about which a great deal more knowledge is needed, however, is the experience of health plans that currently enroll the aged.

The Health Insurance Plan of Greater New York is such a plan. A prepaid voluntary plan now about 11 years old, HIP is organized on a group practice basis and provides comprehensive medical care. Persons covered are entitled to receive medical care from family physicians and specialists in the office, the home, and the hospital. The insurance pays for preventive and diagnostic medical services and for treatment of illness. Laboratory, radiological, and other diagnostic tests as well as physical therapy and services of visiting nurses are included. The only medical services excluded are treatment by a psychiatrist, purely cosmetic surgery, care for drug addiction, anesthesia, and care for chronic illnesses in institutions other than general hospitals.

There are no waiting periods for service in HIP, no exclusions from enrollment because of preexisting conditions, and no limitations on the number of services or duration of medical

Explanatory Notes

Statistics in this report are derived from an enrollment card prepared for each HIP subscriber and from a physician's report form on which the physician records information about each contact with an HIP member. The enrollment card gives the age, sex, and a history of all changes in coverage status for each person insured. The physician's report includes statistics on the age and sex of patients as well as information on where the service was given and the medical specialty.

Physician visits. In general, physician visits refer to face-to-face contacts between the physician and the patient in the office, home, or hospital. Each preoperative visit and each postoperative visit, as well as the operation itself, is considered one physician service. Similarly, each prenatal visit and each postpartum visit is counted as one service.

In counting services of radiologists each reading of an X-ray film of a body part and each field treated with deep roentgen therapy is considered one service. Also counted as one service is each visit for superficial therapy irrespective of the number and location of the fields treated.

Physician visit rates. The average number of physician visits per person per year is obtained by

relating the number of visits to HIP physicians during the year to the average number of persons enrolled in the plan. Average enrollment is the total number of person-months of coverage in a year divided by 12. This, in effect, takes account of the fact that some members are in the plan for only part of a year.

Sampling ratios. Tables showing enrollment and physician utilization experience are based on sample tabulations. The sampling ratio for a specific set of data is indicated in a footnote to the pertinent table. To reduce sampling variability, data are usually combined for a 2- or 3-year period.

Hospitalization rates. Hospitalization rates reflect experience of a 20 percent sample of HIP subscribers who are employees of the city of New York and their dependents enrolled in HIP throughout 1955. All of the enrollees have Blue Cross hospital insurance. Data regarding hospital admissions and length of stay in 1955 were obtained from the claim files of Blue Cross and refer to all hospitalizations in the group, regardless of the type of hospital (voluntary, proprietary, or municipal) or whether the physician was associated with HIP.

care. Medical services are provided by physicians associated with 32 medical groups. Each medical group receives an annual capitation payment for each insured person in that group. Members receive no bill for medical services, the premium paying the entire cost. (The only exception is a possible \$2.00 charge for a night call to the home between 10 p.m. and 7 a.m.)

Enrollment Composition

On June 30, 1957, there were 513,052 persons enrolled in the Health Insurance Plan. About 67 percent were employees of New York City and their dependents; 19 percent were insured through health and welfare plans established by labor groups; 7 percent had converted from group to individual contract; and the remaining 7 percent came from a variety of small employment groups and housing projects.

Initial enrollment is on a group basis only, the usual requirement being that at least 75 percent of those eligible enroll. Contracts ordinarily provide for coverage of the employee (referred to in this report as the subscriber), spouse, and dependent children under 18 years of age. However, a number of union health and welfare plans have signed contracts providing coverage only for the employee. On June 30, 1957, 7.2 percent of HIP's members (subscribers and dependents) were under this type of contract.

Two provisions in the enrollment regulations of HIP are particularly important to older people. First, there are no exclusions because of age or physical condition. Second, any subscriber leaving his group, because of change of job, retirement, or the like, may convert to an individual contract without any loss in benefits. This privilege to convert is not restricted in

any way, not by age, medical condition, nor previous use of services.

In 1957, 23 percent of HIP's members aged 65 years or over had individual contracts as compared with 5.4 percent for all other ages. The age and sex composition of the aged converttees more closely approximates that of the older people in the general population than does the composition of the aged under group contract. More than half of the aged who had converted are over 70 years old, whereas only a fourth of the other aged in HIP are that old (table 1). Also, women constitute a higher proportion of the converttees 65 and over than of the aged under group contract.

Despite the comparatively high percentage of older people with individual contracts through conversion, the proportion of HIP's total enrollment that is 65 years or over (3.6 percent) is substantially lower than the figure for New York City as a whole (9.1 percent). This differential is not surprising since the source of HIP's subscribers is basically employment groups. In time, it might be expected that the conversion privilege would result in a narrowing of the differential. However, there are important deterrents to this process, as discussed in the next section.

Maintenance of Coverage

Experience during the period 1952-54 indicates that each year about 20 percent of the

aged subscribers under group contract are listed for termination of enrollment (table 2). Mortality accounts for almost a fourth of this group. The remaining 16 percent may be listed for termination because the subscriber left his employment group or because he decided to drop HIP. Considering the age group, the principal factor would appear to be retirement from the labor force. (For a detailed analysis of termination rates, based on 1948-51 experience, see reference 4.)

Of the 16 percent listed each year for termination for reason other than death, close to two-thirds fail to convert from group to individual coverage. Since retirement from the labor force is in prospect for all the aged, this rate of loss means that most subscribers at advanced ages drop their insurance. The loss among subscribers under 65 listed for termination is also high (81 percent), but future medical insurance coverage for this group is a distinct possibility, through new jobs or through employed spouses, for example. On the other hand, coverage for the aged once their enrollment has terminated is very unlikely.

The high loss in coverage among subscribers 65 or over is undoubtedly due in part to the financial burden conversion represents. The premium rate under individual contract obtained on conversion is only slightly higher than the rate under group contract. For a two-person family, for example, a group contract costs \$85.45 a year, and an individual contract, \$90

Table 1. Age, sex, and enrollment status of HIP members, June 30, 1957

| Age and sex | Number of members | | | Percentage distribution of members | | |
|-----------------|-------------------|-----------------------------------|----------------|------------------------------------|-----------------------------------|----------------|
| | Total | Individual contract by conversion | Group contract | Total | Individual contract by conversion | Group contract |
| All ages..... | 501, 360 | 30, 240 | 471, 120 | 100. 0 | 100. 0 | 100. 0 |
| Under 65..... | 483, 330 | 26, 170 | 457, 160 | 96. 4 | 86. 5 | 97. 0 |
| 65-69..... | 12, 150 | 1, 900 | 10, 250 | 2. 4 | 6. 3 | 2. 2 |
| 70 or over..... | 5, 880 | 2, 170 | 3, 710 | 1. 2 | 7. 2 | . 8 |
| 65 or over..... | 18, 030 | 4, 070 | 13, 960 | 100. 0 | 100. 0 | 100. 0 |
| Males..... | 11, 410 | 2, 140 | 9, 270 | 63. 3 | 52. 6 | 66. 4 |
| Females..... | 6, 620 | 1, 930 | 4, 690 | 36. 7 | 47. 4 | 33. 6 |

NOTE: Data are based on a 10 percent sample. They refer to persons enrolled in HIP medical groups and exclude a small number of members residing outside

the areas covered by the medical groups. Including out-of-area members, the enrollment on June 30, 1957, was 513,052.

Table 2. Conversion to individual contract in HIP, annual averages, 1952-54

| Enrollment action | Number of subscribers ¹ | | | Percent of total | | |
|---|------------------------------------|-----------------------|-------------------------|-----------------------|-----------------------|-------------------------|
| | All ages ² | Under 65 ² | 65 or over ³ | All ages ² | Under 65 ² | 65 or over ³ |
| Listed for termination, all causes ⁴ ----- | 45, 500 | 42, 470 | 3, 030 | 11. 6 | 11. 3 | 20. 4 |
| Listed for termination, excluding deaths ⁴ ----- | 41, 730 | 39, 400 | 2, 330 | 10. 7 | 10. 5 | 15. 7 |
| Subscribers who convert----- | 8, 300 | 7, 430 | 870 | 19. 9 | 18. 9 | 37. 3 |

¹ Subscribers under group contract except those under contracts with special provisions for insuring the aged on retirement. Subscriber is the person (usually an employee) through whom the family obtained the insurance.

² Based on a 2 percent sample of changes in enrollment status.

³ Based on a 10 percent sample of changes in enrollment status.

⁴ The group for whom a change in status from group enrollment to either individual enrollment or discontinuation in coverage is required.

Occurs when subscriber leaves his group because of retirement or loss or change of job, death, or decision to drop HIP insurance.

⁵ Mortality estimated on basis of rates for white males and white females in Middle Atlantic States, Life Tables for the Geographic Divisions of the United States, 1949-51, Vital Statistics—Special Reports, vol. 41, No. 4, 1956.

⁶ Percent of subscribers listed for termination, excluding deaths.

(not including costs for hospital insurance). The difference, however, is not usually the total increase in out-of-pocket cost to the subscriber, since the great majority enter HIP through group contracts in which part or all of the premium (most often half) is paid by the employer or the union health and welfare fund. On conversion, the subscriber must pay the total premium himself. Thus, on retirement from the labor force the aged are usually faced with a substantial increase in cost of health insurance at a time when their income is reduced and, as will be shown, when their medical needs are great.

Finding ways to permit the aged to maintain their insurance is a major challenge to the community, employer and labor groups, and voluntary health agencies. Steps have already been taken by a number of health and welfare funds to retain the aged employee as part of the group after retirement and to continue paying the premium, but this arrangement is the exception rather than the rule. Only 10 percent of the subscribers in mid-1957 were enrolled by contractor groups that continue to pay the premium after the employee retires.

What about the subscribers who do convert? How long do they remain covered? At the end of the first year, 89 percent of the aged convertees are still in HIP. The rate of attrition diminishes in succeeding years, and by the end of the fourth year 76 percent remain excluding the loss due to death (table 3).

Among subscribers under 65 who convert, the pattern of retention of coverage in HIP is quite different from that for the aged. Only 73 percent are left after a year and 61 percent after 2 years. The loss becomes negligible after that, and 59 percent of these subscribers are in HIP for 4 or more years after conversion.

The far greater loss in the first year among subscribers under 65 than among the aged may well reflect a difference between the two groups in the type of services they anticipate. The aged may expect to need medical care of long duration, whereas the group under 65 will more

Table 3. Retention of coverage by HIP subscribers after conversion to individual contract, 1952-54

| Minimum duration of coverage after conversion (years) | Percent of subscribers ¹ retaining coverage, excluding deaths ² | | |
|---|---|-----------------------|-------------------------|
| | All ages ³ | Under 65 ³ | 65 or over ⁴ |
| 1----- | 74. 4 | 72. 5 | 88. 5 |
| 2----- | 63. 5 | 60. 8 | 82. 0 |
| 3----- | 62. 1 | 59. 7 | 76. 9 |
| 4----- | 61. 7 | 58. 9 | 75. 5 |

¹ Subscriber is the person (usually an employee) through whom the family obtained the insurance.

² See footnote 5, table 2.

³ Based on a 2 percent sample of changes in enrollment status.

⁴ Based on a 10 percent sample of changes in enrollment status.

likely require short-term care, such as obstetrical or pediatric services. Furthermore, other opportunities for group enrollment may appear for the subscriber under 65, but not for the aged.

Volume of Services

The amount of medical care an HIP member receives is unrestricted by administrative regulation. Members are encouraged to use medical group service efficiently and to employ sound health practices based on current scientific knowledge through a varied and continuous educational program which HIP's division of health education has helped each medical group to develop.

In this setting, one might expect a pattern of medical care behavior different in some respects from that of the general community. The results of a household survey conducted in 1952 suggest that this is indeed true (5). This study indicates that the proportion of HIP members who see a physician sometime during the year is higher than the figure for the total popula-

tion of New York City, 69 percent as compared with 57 percent. The time between onset of illness and when a doctor is seen seems to be somewhat shorter for persons covered by the plan, but once having seen a physician for a particular ailment HIP members appear to make fewer visits than do persons in the city as a whole. These findings provide a broad, general background for interpreting the rates of medical care presented in the rest of this report.

Seventy percent of the members 65 years of age and over see an HIP physician at least once during the year (table 4). This is about the same proportion as in the age group 45-64 years, but it is somewhat below the figure for younger adults and appreciably lower than the figure for children. The finding that 3 in 10 of those of middle and advanced age do not see a doctor during the year is of particular interest because of the special emphasis on the value of periodic medical examinations at these ages. It is apparent that the availability of comprehensive medical care with no economic deterrent does

Table 4. Physician visits by age, sex, and conversion status of HIP members

| Age and conversion status | Percent of members seen by HIP physicians, July 1, 1955-June 30, 1956 ¹ | | | Number of physician visits per person per year, 1955-56 | | |
|--|--|------|--------|---|------|--------|
| | Total | Male | Female | Total | Male | Female |
| <i>All members</i> | | | | | | |
| All ages..... | 74.0 | 72.5 | 75.5 | ² 5.2 | 4.8 | 5.5 |
| Under 65..... | 74.2 | 72.8 | 75.7 | 5.1 | 4.7 | 5.5 |
| Under 15..... | 82.0 | 82.7 | 81.4 | 5.0 | 5.4 | 4.7 |
| 15-44..... | 72.1 | 69.7 | 74.3 | 4.9 | 3.9 | 5.9 |
| 45-64..... | 68.8 | 66.6 | 71.4 | 5.5 | 5.2 | 5.9 |
| 65 or more..... | 69.7 | 68.6 | 72.0 | 7.3 | 7.6 | 6.8 |
| <i>Individual contract by conversion</i> | | | | | | |
| All ages..... | 85.6 | 83.8 | 87.3 | 7.5 | 6.8 | 8.1 |
| Under 65..... | 85.8 | 83.9 | 87.5 | 7.3 | 6.3 | 8.2 |
| 65 or more..... | 83.6 | 81.3 | 85.9 | 9.3 | 10.8 | 7.6 |
| <i>Group contract</i> | | | | | | |
| All ages..... | 73.2 | 71.9 | 74.7 | 5.0 | 4.7 | 5.4 |
| Under 65..... | 73.5 | 72.3 | 74.9 | 5.0 | 4.7 | 5.4 |
| 65 or more..... | 65.6 | 65.9 | 65.0 | 6.9 | 7.0 | 6.5 |

¹ Data apply to subscribers enrolled in HIP throughout this period and their dependents who were insured on June 30, 1956.

² This figure differs somewhat from the rate (5.3) based on 100 percent counts.

NOTE: Data based on a 10 percent sample of the HIP enrollment.

not, by itself, insure the use of preventive services.

Despite the comparatively low proportion of older members who see a physician, the average number of visits this group makes during the year (7.3) is 40 percent higher than the rate for HIP as a whole (5.2). The difference results from the fact that more of the older people than of other age groups receive large volumes of service. Among the aged 8.3 percent see a doctor at least 20 times in a year as compared with 4.2 percent of all members. Another point of interest is that aged members who receive this many services account for almost half the care (47 percent) obtained by the entire group 65 or older.

The rate at which physicians' services are received is higher among the aged not only as compared with all HIP members but also as compared with any other 5-year age group (see chart). The high rate at the older ages, however, does not represent a sharp departure from the experience at earlier ages, but rather is the end point of an upward trend in the rate after ages 35-39.

This difference between older persons and others in physician utilization is a decided change from the experience of HIP in 1948 and 1949. During this early period, the aged received physicians' services in HIP at only a

slightly higher rate, about 10 percent, than all members (6). The 1948-49 experience may have been strongly influenced by special factors applicable to the first few years of the plan, for example, greater dependence of the members on physicians not in HIP than is true today.

Utilization of physicians' services differs among men and women 65 years and over. At these ages a higher proportion of the women than of the men see a doctor during the year, but the relative volume of services is greater among the men. Among all other adults the rate at which women see a doctor is either the same as for men or higher. Actually, the rate for women in HIP is greater at the high fertility ages of 20-29 than at the advanced ages. Among adult males the rate at ages 65 and over is far above that at any other age.

Particularly illuminating are the figures in table 4 on physician visits for two categories of the aged, those who have converted to individual contract and those under group contract. Utilization, it will be noted, is much higher in the former group (who are older on the average) with respect both to the proportion who see a physician during the year and to the average number of such visits. This type of differential is not peculiar to the aged, as indicated by the data for those under 65. It may result

Physician visit rates by age and sex of HIP member, 1955-56

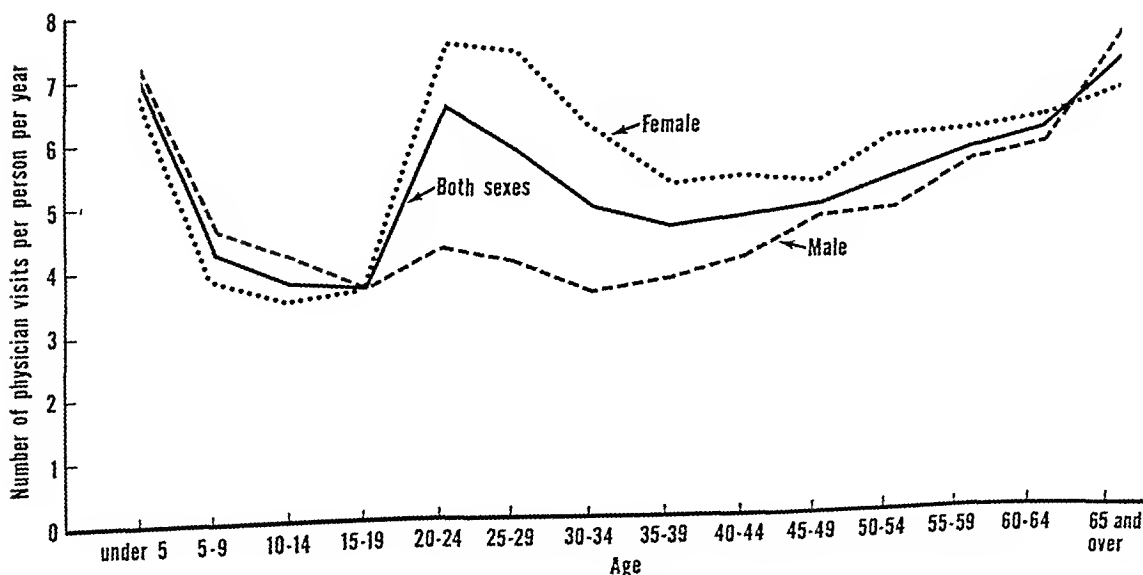


Table 5. Physician visit rates by type of physician for HIP members of specified age and enrollment status, 1955-56

| Type of physician | Number of physician visits per 100 persons per year | | | | | | | | | |
|---|---|----------|-------|-------|------------|-----------------------------------|----------|------------|-----------------------|------------|
| | All members | | | | | Individual contract by conversion | | | Group contract | |
| | All ages | Under 15 | 15-44 | 45-64 | 65 or over | All ages | Under 65 | 65 or over | All ages ¹ | 65 or over |
| All physicians ² ----- | 517.4 | 504.5 | 494.2 | 552.0 | 732.0 | 748.2 | 730.5 | 931.6 | 504.7 | 686.1 |
| Family physician ³ ----- | 298.2 | 386.8 | 237.7 | 289.2 | 405.4 | 416.9 | 406.4 | 529.7 | 291.7 | 376.8 |
| Internist----- | 19.5 | 2.1 | 14.7 | 40.7 | 63.3 | 36.9 | 31.5 | 80.5 | 18.5 | 59.4 |
| Ophthalmologist and otolaryngologist----- | 32.9 | 28.2 | 28.3 | 43.2 | 55.8 | 40.1 | 37.2 | 60.5 | 32.5 | 54.7 |
| Radiologist----- | 40.3 | 20.9 | 42.8 | 55.9 | 55.2 | 48.7 | 46.7 | 64.6 | 39.8 | 53.0 |
| Surgeon----- | 24.1 | 10.6 | 23.6 | 37.7 | 47.2 | 37.1 | 34.7 | 59.6 | 23.4 | 44.3 |
| Urologist----- | 7.7 | 3.0 | 4.5 | 13.8 | 46.4 | 14.1 | 8.9 | 53.4 | 7.4 | 44.8 |
| Orthopedist----- | 15.8 | 15.7 | 12.8 | 19.8 | 23.5 | 26.0 | 26.2 | 26.6 | 15.2 | 22.8 |
| Dermatologist----- | 13.5 | 9.8 | 15.1 | 14.8 | 16.5 | 18.1 | 17.6 | 22.8 | 13.2 | 15.1 |
| Allergist----- | 20.1 | 20.3 | 24.6 | 15.3 | 5.6 | 25.5 | 27.9 | 10.7 | 19.8 | 4.4 |
| Obstetrician-gynecologist----- | 41.4 | 5.5 | 86.9 | 14.5 | 5.3 | 78.0 | 88.0 | 5.4 | 39.4 | 5.2 |

¹ Rates for persons under 65, not shown separately, closely approximate the rates for all ages.

² Includes specialists not shown separately.

³ Includes pediatricians' services. Exclusion of these

services reduces the family physician rate for all persons to 243.8 and the rate for children under 15 to 196.8.

NOTE: Data based on a 10 percent sample of the HIP enrollment.

to a considerable extent from self-selection on the part of a subscriber, whether or not aged, when faced with a choice of converting to individual enrollment or dropping his insurance.

In view of the comparatively high requirements among the aged for physicians' services, the question might well be asked, what would happen to the volume of physician services in HIP if the aged were represented in the plan in the same proportion as they are in the general population? Some indication of the result can be obtained if it is assumed that (a) the rate of visits found among the aged on group contract is applicable to all the aged in the city's labor force and (b) the rate for those who converted to individual contracts is applicable to all of the noninstitutionalized aged not in the labor force. Under these assumptions, increasing the proportion of the aged in HIP from 3.6 percent to 9.1 percent would raise the average number of physician visits per member per year from 5.2 to 5.5.

The impact of this relatively small increase on the operations of a medical care plan may not be reflected entirely by what happens to the overall rate. A full assessment would require, among other things, currently unavailable data

on ancillary services to the aged and knowledge about the kinds of physicians' services this age group receives. The latter is discussed in the sections that follow.

Specialists' Services

Associated with each medical group in HIP are physicians in 12 basic specialties. The opportunity to call on a specialist is one of the most important advantages of the plan both to the member and to his family physician.

As medical problems vary with age, so do requirements for services from specialists. Throughout adult life, visits to all but a few of the specialists increase to reach a peak among the aged (table 5). Utilization of surgeons, internists, and urologists is especially high at ages 65 and over as compared with the rates for all ages combined.

Paralleling the increase in the requirement among the aged for care from the specialist is the greater volume of services that the family physician is called on to give. While the average number of visits to the family physician for older persons is 4.1, the corresponding figure for adults in each of the 2 age groups shown in table 5 is less than 3.0 per person.

The pattern of utilization of medical services is very similar among men and women 65 or over in a number of important respects. The rates for the two sexes are virtually the same in the use of family physicians, ophthalmologists and otolaryngologists, and radiologists (table 6). However, the men have a substantially higher rate of service from the internists and, of course, from the urologist, while women see the orthopedist more often.

No specialty can be identified as bearing a particularly heavy part of the greater utilization by the aged who have converted to individual contract as compared with the aged under group contract. The rate at which general physicians are used increases by about the same proportion as the rate for all services, and major increases occur in a wide range of specialties, including internal medicine, surgery, and radiology.

Place of Service

The proportions of physician visits that take place in the office, in the home, and in the hos-

pital differ greatly according to age. The outstanding characteristic of the pattern among the older people is the exceptionally high proportion of visits in the hospital, 21 percent as compared with 11 percent for all ages. The difference is even greater on a rate basis. Services in the hospital are received from HIP physicians by the aged at the rate of 154 per 100 members, which is almost three times the rate of 57 for all persons in HIP (table 7). Contributing to the high rate for the aged are both high hospital admission rates and long hospital stays (table 8).

The average number of visits to the physician's office is likewise greater among those 65 and over, but the margin is far smaller than is found in hospital care. Although the home call rate for the aged is higher than for other adults, it is slightly below the rate for persons of all ages, which is affected markedly by frequent home visits to children.

Among the aged, men utilize physician services in the hospital at an appreciably higher rate than do women (table 7). The differential

Table 6. Physician visit rates by type of physician for HIP members of specified age, sex, and enrollment status, 1955-56

| Type of physician, by sex of HIP member | Number of physician visits per 100 persons per year | | | | | | |
|---|---|------------|-----------------------------------|----------|------------|-----------------------|------------|
| | All members | | Individual contract by conversion | | | Group contract | |
| | All ages ¹ | 65 or over | All ages | Under 65 | 65 or over | All ages ¹ | 65 or over |
| Males² | 481.4 | 759.7 | 681.2 | 629.1 | 1,075.0 | 471.1 | 703.0 |
| Family physician ³ | 292.4 | 409.5 | 410.0 | 387.7 | 593.6 | 286.4 | 376.3 |
| Internist | 21.4 | 66.6 | 34.0 | 25.8 | 87.9 | 20.8 | 62.8 |
| Ophthalmologist and otolaryngologist | 32.9 | 55.5 | 36.8 | 33.3 | 58.9 | 32.7 | 54.9 |
| Radiologist | 38.9 | 56.6 | 46.2 | 43.0 | 68.2 | 38.6 | 54.5 |
| Surgeon | 27.1 | 54.3 | 41.6 | 35.6 | 86.8 | 26.4 | 48.4 |
| Urologist | 12.2 | 67.7 | 25.3 | 14.6 | 95.7 | 11.5 | 62.7 |
| Orthopedist | 15.7 | 16.2 | 25.5 | 26.2 | 23.2 | 15.2 | 14.9 |
| Females² | 554.5 | 678.9 | 809.3 | 820.0 | 765.7 | 539.6 | 649.5 |
| Family physician ³ | 304.2 | 397.5 | 423.2 | 423.0 | 455.8 | 297.2 | 377.8 |
| Internist | 17.5 | 57.0 | 39.6 | 36.6 | 71.9 | 16.2 | 52.0 |
| Ophthalmologist and otolaryngologist | 32.8 | 56.3 | 43.0 | 40.7 | 62.4 | 32.2 | 54.3 |
| Radiologist | 41.6 | 52.5 | 51.0 | 50.0 | 60.3 | 41.1 | 49.8 |
| Surgeon | 21.0 | 33.6 | 32.9 | 33.8 | 28.1 | 20.3 | 35.4 |
| Urologist | 3.2 | 5.6 | 3.9 | 3.9 | 4.5 | 3.2 | 6.0 |
| Orthopedist | 15.8 | 37.5 | 26.4 | 26.2 | 30.6 | 15.2 | 39.9 |
| Obstetrician-gynecologist | 82.2 | 15.3 | 144.8 | 160.6 | 11.6 | 78.6 | 16.6 |

¹ Rates for persons under 65, not shown separately, closely approximate the rates for all ages.

² Includes specialists not shown separately.

³ Includes services by pediatricians. Exclusion of

these services reduces the family physician rate for all males to 235.3 and for all females to 252.5

Note: Data based on a 10 percent sample of the HIP enrollment.

is due entirely to a wide gap in hospital admission rates for the two sexes, the average length of stay being virtually the same. The

relationship between the rates of service in the hospital for men and women is not repeated for services in the office or at home. In fact,

Table 7. Physician visit rates by place of service for HIP members of specified age, sex, and enrollment status, 1955-56

| Place of service, by sex of HIP member | Number of physician visits per 100 persons per year | | | | | | | | | |
|--|---|-------------|-------|-------|---------------|--------------------------------------|-------------|---------------|--------------------------|---------------|
| | All members | | | | | Individual contract by conversion | | | Group contract | |
| | All ages | Under 15 | 15-44 | 45-64 | 65 or over | All ages | Under 65 | 65 or over | All ages ¹ | 65 or over |
| Both sexes..... | 517.4 | 504.5 | 494.2 | 552.0 | 732.0 | 748.2 | 730.5 | 931.6 | 504.7 | 686.1 |
| Office..... | 408.9 | 358.3 | 411.6 | 453.1 | 530.1 | 564.9 | 558.2 | 643.9 | 400.3 | 503.9 |
| Home..... | 51.8 | 115.0 | 25.3 | 25.8 | 48.4 | 73.8 | 75.2 | 69.3 | 50.6 | 43.5 |
| Hospital..... | 56.7 | 31.3 | 57.3 | 73.1 | 153.5 | 109.5 | 97.1 | 218.4 | 53.8 | 138.6 |
| Males..... | 481.4 | 535.7 | 388.2 | 522.1 | 759.7 | 681.2 | 629.1 | 1,075.0 | 471.1 | 703.0 |
| Office..... | 380.9 | 379.7 | 342.2 | 420.8 | 535.6 | 517.9 | 494.6 | 697.9 | 373.9 | 506.4 |
| Home..... | 51.4 | 119.8 | 21.7 | 22.8 | 43.3 | 68.9 | 72.5 | 53.2 | 50.5 | 41.5 |
| Hospital..... | 49.1 | 36.2 | 24.3 | 78.5 | 180.8 | 94.4 | 62.1 | 323.9 | 46.7 | 155.0 |
| Females..... | 554.5 | 471.3 | 589.7 | 586.8 | 678.9 | 809.3 | 820.0 | 765.7 | 539.6 | 649.5 |
| Office..... | 437.7 | 335.4 | 474.2 | 490.7 | 519.5 | 607.9 | 614.4 | 581.4 | 427.7 | 498.6 |
| Home..... | 52.2 | 109.9 | 28.4 | 29.3 | 58.0 | 78.2 | 77.6 | 88.0 | 50.7 | 47.8 |
| Hospital..... | 64.6 | 26.0 | 87.1 | 66.8 | 101.4 | 123.2 | 128.0 | 96.3 | 61.2 | 103.1 |

¹ Rates for persons under 65, not shown separately, closely approximate the rates for all ages.

NOTE: Data based on a 10 percent sample of the HIP enrollment.

Table 8. Hospital admission rates and average length of hospital stay for HIP members, by age and sex, 1955

| Age | Both sexes | | Males | Females | |
|---|---------------------|-----------------------------------|--------|---------------------|-----------------------------------|
| | All ad- missions | Nonobstet- rical admissions | | All ad- missions | Nonobstet- rical admissions |
| <i>Hospital admission per 1,000 persons</i> | | | | | |
| All ages ¹ | 77. 4 | 59. 6 | 54. 0 | 101. 2 | 65. 2 |
| 15-44..... | 93. 2 | 57. 0 | 40. 4 | 154. 3 | 71. 6 |
| 45-64..... | 79. 1 | 79. 1 | 71. 9 | 87. 6 | 87. 6 |
| 65 or over..... | 121. 2 | 121. 2 | 131. 0 | 102. 0 | 102. 0 |
| <i>Days in hospital per admission</i> | | | | | |
| All ages ¹ | 7. 6 | 8. 1 | 8. 8 | 6. 9 | 7. 6 |
| 15-44..... | 6. 5 | 7. 0 | 7. 5 | 6. 2 | 6. 8 |
| 45-64..... | 11. 0 | 11. 0 | 11. 9 | 10. 2 | 10. 2 |
| 65 or over..... | 13. 2 | 13. 2 | 13. 4 | 12. 6 | 12. 6 |
| <i>Days in hospital per 100 persons</i> | | | | | |
| All ages ¹ | 58. 8 | 48. 6 | 47. 6 | 70. 3 | 49. 6 |
| 15-44..... | 65. 3 | 40. 0 | 30. 4 | 96. 1 | 48. 5 |
| 45-64..... | 87. 3 | 87. 3 | 85. 3 | 89. 5 | 89. 5 |
| 65 or over..... | 159. 5 | 159. 5 | 175. 7 | 128. 0 | 128. 0 |

¹ Includes hospitalizations of children under 15.
Source: Prepaid Medical Care and Hospital Utilization, by Paul M. Densen, Eve Balamuth, and Sam

Shapiro, Hospital Monograph Series No. 3, Chicago, American Hospital Association, 1958.

care in the home is received relatively more often by aged women than by aged men.

As pointed out previously, among members both over 65 years and under that age those who have converted to individual contract use physician services at a considerably higher rate than the group subscribers. This difference results from more frequent use of physicians' services not only in the office but also in the home and in the hospital (table 7).

One of the most interesting utilization experiences among the aged converttees is the rate at which the men receive physician services in the hospital. This figure (324 per 100 persons per year) is more than twice the rate among aged men under group contract (155) and several times the average for HIP as a whole (57).

Hospitalized Surgery

The rate of operations performed in the hospital is higher for the aged (45 per 1,000 persons per year) than for all HIP (35 per 1,000) (table 9). The differential is far smaller than that in the rate for all hospital admissions, but it represents a difference of 27 percent, a not inconsequential margin.

The surgery rate is comparatively high in the aged group mainly because of the high rate for men. The rate for aged women (36 per 1,000) is near the average for all females (34) and, in fact, is slightly lower than that for other adult females. On the other hand, the rate for aged men (50) is well above the figure for men at younger ages.

Unlike other categories of utilization, hospitalized surgery for the aged is not more frequent among the converttees than among persons covered by group contracts. The rates are nearly the same, 43 and 45 per 1,000 respectively.

Requirements for surgery are only partly defined by total rates. Detailed data regarding operative procedures are needed for complete analysis. Only a few such data are now available. As indicated by the rates in table 9 for broad categories of procedures, the aged differ substantially from persons of all ages in the types of operations they undergo.

Gastrointestinal, abdominal, and genitourinary operations account for about three-fifths of the hospitalized surgery among the aged as compared with two-fifths of the surgery at all ages. Furthermore, from the limited data

Table 9. Hospitalized surgery rates for HIP members, by type of operation and age and sex, 1956

| Type of operation, by sex | Number of operations per 1,000 persons per year | | | | |
|--------------------------------|---|------------------|-------------|-------------|-------------|
| | All ages | Under 15 | 15-44 | 45-64 | 65 or over |
| Both sexes | 35.3 | 40.2 | 30.6 | 36.7 | 44.7 |
| Eye, ear, nose, and throat | 6.5 | 17.3 | 2.0 | 2.3 | 5.0 |
| Gastrointestinal and abdominal | 7.0 | 4.9 | 6.3 | 11.8 | 13.1 |
| Genitourinary | 6.4 | 14.6 | 1.6 | 4.5 | 13.1 |
| Orthopedic | 6.4 | (¹) | 11.3 | 6.5 | 2.0 |
| Other | 2.0 | 1.7 | 1.9 | 2.4 | 2.8 |
| Male | 36.5 | 57.3 | 20.9 | 34.7 | 49.5 |
| Eye, ear, nose, and throat | 7.4 | 18.0 | 2.9 | 2.8 | 5.1 |
| Gastrointestinal and abdominal | 9.7 | 7.1 | 7.6 | 14.9 | 14.1 |
| Genitourinary | 11.6 | 27.9 | 1.8 | 6.7 | 18.7 |
| Orthopedic | 2.2 | 2.4 | 2.1 | 2.2 | 2.3 |
| Other | 5.7 | 2.0 | 6.4 | 8.1 | 9.3 |
| Female | 34.1 | 22.1 | 39.2 | 38.9 | 36.1 |
| Eye, ear, nose, and throat | 5.7 | 16.6 | 1.3 | 1.8 | 4.8 |
| Gastrointestinal and abdominal | 5.4 | 2.5 | 5.3 | 8.3 | 11.3 |
| Genitourinary | 1.3 | .3 | 1.3 | 2.2 | 3.1 |
| Orthopedic | 12.9 | (²) | 21.2 | 13.5 | 5.5 |
| Other | 1.7 | .9 | 1.6 | 2.7 | 3.8 |
| Other | 7.0 | 1.6 | 8.6 | 10.3 | 7.6 |

¹ Rate is less than 0.1.

² Includes circumcision of newborn. Exclusion of these procedures reduces the rate for all males to 29.4, and the rate for males under 15 to 32.8.

³ Includes circumcision of newborn. Exclusion of

these procedures reduces the rate for all males to 4.4 and the rate for males under 15 to 3.5.

NOTE: Data based on a sample consisting of all operations performed in hospitals during alternate months in 1956.

available, it appears that the nature of the operations within broad categories differs with age. This is illustrated most clearly with respect to eye, ear, nose, and throat operations. In this category two-thirds of the operations among the aged are for cataract and glaucoma (3.4 per 1,000 persons over 65) whereas at younger ages by far the most frequent surgical procedure is tonsillectomy (5.0 per 1,000 persons under 65).

Summary and Discussion

The enrollment and medical care experience of the aged in the Health Insurance Plan of Greater New York has been examined from a number of standpoints bearing on current discussions of health insurance for the aged. In generalizing it is important to keep in mind the characteristics of this medical care plan. It is prepaid, comprehensive in coverage for all medical services, and it provides care through medical groups. There are no restrictions on enrollment because of age or preexisting conditions. Initial enrollment is principally through employment groups, but subscribers leaving their groups have an unrestricted privilege of converting to individual contract.

The outstanding feature of HIP's enrollment experience with aged subscribers is that despite the conversion privilege most of those who must decide whether to convert or to terminate coverage drop their insurance. This situation illustrates the paradoxical position of many members of health insurance plans when they reach retirement age. Group coverage is obtained while they are employed and for an increasing proportion of them under arrangements whereby the employer or a health and welfare fund pays at least part of the premium. On leaving employment, many of the subscribers are faced with the dual economic problem of reduced income and increased out-of-pocket costs to maintain their insurance. And this occurs at a time when their medical needs are increasing. A pertinent question for the community is where and how do the aged whose health insurance is terminated obtain medical care. It would be of much interest, for example, to determine the extent to which former HIP enrollees become dependent on hospital clinics and ward facilities.

With respect to the medical care requirements of the aged, HIP's experience affords several observations:

1. The aged see a physician on the average considerably more often than do persons of all ages combined. The rates are 7.3 physicians' visits per member per year for the aged and 5.2 for the total enrollment. The older people who have converted to individual contract average 9.3 visits to a physician per year.

These rates are unquestionably high, but they are not quite so forbidding when it is realized that the rates are also high in other age groups (60-64, 20-29, and under 5 years). Viewing voluntary health insurance as a community institution, it is appropriate to consider what would happen if the aged were represented in HIP in the same proportion as in the total population. In New York City, this would mean an increase in the aged subscribers from 3.6 to 9.1 percent, and an estimated rise in the rate of physician visits of 6 percent (provided the aged added to HIP were representative of all the noninstitutionalized aged in the city). This is a small quantitative increase, but its true impact on the medical care plan cannot be fully assessed without information about the qualitative aspects of the care received by the aged.

2. Most of the medical specialties are affected by the comparatively high medical requirements of the aged. The greatest effect is on the surgeon, the internist, and the urologist. Of equal significance is the fact that the family physician continues to occupy a central position in providing medical care to the aged. Thus an increase in enrollment of the aged would require not only an expansion, in varying degrees, in some of the specialties but also the addition of family physicians.

3. Extensive use of hospital care is a major reason for the comparatively large volume of physicians' services received by the aged in HIP. More than a fifth of the contacts the aged have with the physician (21 percent) take place in the hospital; the corresponding figure for members of all ages is 11 percent. A higher surgery rate is an important factor in this situation, although there are indications that admissions for services other than surgery contribute more to the high hospital rate. The type of operation performed on the aged differs from

the type for younger persons. This may have greater bearing in evaluating the surgical requirements of the aged than the general rates of operations performed. A full exploration of this point is dependent on the development of data concerning specific operations.

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Arthur S. Flemming, Secretary

Marion B. Folsom, Secretary of Health, Education, and Welfare, resigned from his post July 31, 1958. Mr. Folsom became Secretary August 1, 1955, after having served as Under Secretary of the Treasury for 2½ years.

He had previously been active in social security programs for more than 25 years.

In 1928, he developed a life insurance, retirement, and disability plan for employees of Eastman Kodak Company and 3 years later Mr. Folsom developed an unemployment benefit plan which included 13 other companies in Rochester, N. Y.

His work in Federal social security began with membership on the President's Advisory Council on Economic Security which helped draft the original Social Security Act in 1934.

In 1942 he helped organize the Committee for Economic Development, of which he later became chairman, and in 1944-46 he served as staff director for the House Committee on Postwar Economic Policy and Planning.

During his tenure with the Treasury Department, he worked with the Department of Health, Education, and Welfare on a study of old-age and survivors insurance resulting in extension of coverage and liberalization of benefits under the 1954 amendments to the Social Security Act.

Arthur S. Flemming, president of Ohio Wesleyan University since 1948, succeeds Secretary Folsom. While on leave from his university post, Mr. Flemming served as director of the Office of Defense Mobilization, during 1953-57, and as assistant to the Director of that agency in the years 1951-53.

A member of the United States Civil Service Commission during 1939-48, he was also chief of labor supply in the Office of Production Management in 1941-42, chairman of the Management-Labor Policy Committee of the War Manpower Commission during the next 4 years, and on the Manpower Survey Board of the Department of the Navy in 1943 and 1944.

Mr. Flemming was twice a member of the Commission on Organization of the Executive Branch of Government, during 1947-49 and again in 1953-55, and served as chairman of the Advisory Committee on Personnel Management of the Atomic Energy Commission from 1948 to 1953. He has been a member of the International Civil Service Advisory Board since 1950 and of the President's Advisory Committee on Government Organization since 1953.

From 1930 to 1934, Mr. Flemming was on the editorial staff of the publication now known as the *U. S. News & World Report*.

Nursing Home GOALS

The First National Conference on Nursing Homes and Homes for the Aged, called by the Public Health Service, was held February 25-28, 1958, in Washington, D. C. Some 150 persons, representing individual homes, social service organizations, State health and welfare departments, and 32 national associations met to discuss measures for improving services to the chronically ill and aged. The goals set by the participants, their recommendations on how these goals can be reached, and three of the addresses at the conference are summarized on the following pages. The full proceedings are being published by the Public Health Service.

Achieving the Goals

The Federal role in achieving the goals of this conference is necessarily an auxiliary one, affording certain aids and opportunities that are valuable only to the extent that they are used, creatively and imaginatively, by the States and communities. A review of current activities of the Public Health Service and other units

This summary is based on a paper presented by David E. Price, M.D., chief, Bureau of State Services, Public Health Service.

of the Department of Health, Education, and Welfare as they relate to these goals may spark your thinking on ways you can use existing aids to greater advantage and suggest to you recommendations for additional activity which we could legitimately undertake.

Goal 1. Several national studies, completed, in progress, or planned, should help to advance this goal. One of them, already published, is especially pertinent: *Nursing Homes, Their Patients and Their Care*. Knowing the characteristics of the people in these homes is an important first step toward determining the services and facilities they require.

Other studies now under way, such as the U. S. National Health Survey which began in July 1957, and the sample survey of Old Age and Survivors Insurance beneficiaries which will be conducted this year, can be expected to give us additional data that will be helpful.

Goal 2. Perhaps the most notable contribution the Federal Government has made in this area is the so-called standard-setting amendment to certain public assistance titles of the Social Security Act. Prior to this legislation, there was no way substandard homes could be forced to provide at least the essentials of decent living for older people. Now, all States have regulatory authority over most types of homes even though all States do not have it for all types of homes. Licensing authorities in both the State welfare departments and the State health departments have recognized that the most important contribution they can make to the improvement of services is not through the use of police power, but through the assistance they can offer home operators.

Goal 3. The Federal Government has been active in many facets of the knotty financial problems involved in improving the services and facilities of nursing homes.

The Hill-Burton program provides a strong financial incentive to States and communities to create much needed facilities. Since 1955, about \$21 million in matching funds have been provided annually for construction of facilities primarily serving patients with long-term illnesses. Four hundred projects, adding 3,900 chronic disease beds, 4,500 nursing home beds, and other facilities, were aided by these special funds.

Public assistance financing has also been liberalized. Legislation in 1956 not only increased the Federal share in assistance payments but also provided a separate formula and additional funds for medical care.

Here again, however, there are wide variations in the value an area receives for its Federal aid dollar. For example, with the constantly increasing number of older people in the population, general hospitals, planned, staffed, and organized to provide costly care for patients with acute illness, find that more and more of their beds are occupied by long-term patients.

Conference Goals

1. To determine the essential elements of service in the different classifications of homes.
2. To delineate more clearly ways in which accrediting, standard-setting, and regulatory agencies may assist in improving the quality of care in nursing homes and homes for the aged.
3. To encourage a more realistic attitude in financing the cost of facilities and services provided by nursing homes and homes for the aged.
4. To explore the need for and methods of providing public, professional, patient, and family education.
5. To explore ways and means of providing consultative services and assistance to administrators and staffs of nursing homes and homes for the aged.
6. To set guidelines for future action.

Many of these same patients could be cared for at far less cost in nursing homes where medical care is available.

Similarly, public assistance payments for medical care are often much higher than they would need to be if the community were willing to invest more in public health programs that prevent the development of chronic diseases, retard their progress, and minimize their effects. Multiple screening projects for the early detection of chronic conditions would reduce the need for institutional care. Rehabilitation programs, planned cooperatively by health and welfare agencies, hospitals, homes, and physicians, would help to reduce the time period when costly medical and nursing care is required.

Goal 4. In the field of professional education, we can already count solid gains: the Public Health Service traineeship programs for nurses and public health personnel into which some \$5 million is being invested this fiscal year and the authorization for a program of grants to States for extending the number of trained public assistance personnel, to mention only two of the most recent ones.

Another educational approach is through publications. For example, there is now available an illustrated booklet showing in detail the exercises that will help stroke patients. This will make it possible for the general practitioner, his patient, and the patient's family to work out a regimen of exercises. The new diet booklets prepared for heart disease patients on sodium-restricted diets, sponsored by the Public Health Service and a number of voluntary and professional agencies, are designed for the same type of use. Other examples are the manuals *How to be a Nursing Aide in a Nursing Home*, produced cooperatively with the American Nursing Home Association, and *The Older Person in the Home*, and, of course, the periodical *Aging* which is issued by the Department's Special Staff on Aging.

Goal 5. The Public Health Service last year received from Congress an additional \$3 million in general health grants to assist States to develop programs in chronic disease and other health areas not covered by the traditional type of public health activity. A gratifying number of States elected to use their share of this fund to strengthen their consultative services to nursing homes. Altogether, 75 percent of this fund has gone into chronic disease and health of the aging programs.

Other units of the Department have also taken measures to strengthen their service component. The Bureau of Old-Age and Survivors Insurance, for example, has recently established a welfare branch to help its field staff give better service to OASI beneficiaries who consult them about nursing homes and other personal problems. Recent public assistance legislation encourages welfare agencies to extend their social services to older persons, a significant step because social problems are quite as important as medical problems. The well-balanced nursing home program makes provision for dealing with both.

Goal 6. I hope this partial review of Federal programs will prove of some value to you in achieving your final goal of setting guidelines for future action. For any Federal effort to be meaningful, it must be backed by local action. Every type of Federal aid, to be of

real value, must evolve from firm roots in local soil; otherwise you may have paper progress, token action, but you will not really change the lives and outlook of the rapidly growing millions of the very old.

This First National Conference on Nursing Homes and Homes for the Aged will indeed become historic if it marks the beginning of a concerted drive to give our chronically ill and aged the kind of care that each of us would hope to have when it comes our time to enter into that final stage of life.

The Heart of the Matter

In a certain nursing home lives a little old lady, aged 90 years, a former school teacher. She is happy, active, comfortable, busy with crossword puzzles, books, and newspapers. She takes a daily walk around the block with the aid of her aluminum walker and watches the world go by from her cheerful front-room window.

A year ago, she was alone in the world, living in a house that had been her home for nearly 50 years. When a severe stroke crippled her, she was living in squalor, helpless in an unheated room. The postman missed her usual greeting one day, and getting no response to his knock, he summoned the police. After a few weeks in the hospital, she was removed to a nursing home.

There, with skilled care under a physician's supervision, she was restored to her present state of self-care, better health, comfort, and good spirits. Her pension and funds from the sale of her house assure her good care in the nursing home as long as she lives. Her remaining years will be far happier there than in any other setting.

She (with some 300,000 others in nursing homes and homes for the aged) is the focal point of your deliberations. Never lose sight of her, or her counterpart in some home known to you.

It is not easy to keep focused on the human factor. We deal with scores of impersonal

This summary is based on remarks by Leroy E. Burney, M.D., Surgeon General of the Public Health Service.

factors. Physicians may tend to think of diseases and diagnoses, administrators of programs and procedures, nurses of medications and supervisory problems, social workers of caseloads and therapeutic interviews.

But if we think exclusively of our own little specialties, we do so at the peril of the people we serve. For although each of us makes a necessary contribution, no one has all the knowledge, the skills, and the resources to place and maintain this elderly, retired school teacher in her present happy state.

Nor can we think exclusively of our particular zones of responsibility, whether it is national, State, or local. What is done or not done in each zone, in the national agency, the State, the community, and the nursing home affects in some degree all other zones. And this in turn affects for better or worse the people in nursing homes and homes for the aged. We who have any kind or degree of responsibility for the well-being of aged people cannot afford to let a colleague's efforts go unmarked with respect, his successes without rejoicing, nor his failures without prompt help.

Kaleidoscope of Health Services

There is no ideal pattern for nursing homes and homes for the aged in the kaleidoscope of health services for older people. The health services that older people require, like the bits of colored glass in a kaleidoscope, can be arranged in an endless variety of harmonious, effective patterns to suit the circumstances of any individual, any family, any community, or any State. The nursing home is just one piece, and its place in the pattern depends on the availability and quality of other health services for the aged.

This is a vast kaleidoscope, and we must keep our eyes on single bits of this pattern which concern this conference. We must seek a common vantage point from which we can describe the place of the homes and their quality in practical terms as realistic goals for every institution, community, State, and national organization.

Facilities and services that permit better care of older people are at the center of the larger

problems of aging. This lack keeps tens of thousands of older patients in general hospitals when they no longer need full hospital services. The lack of enough high-quality nursing homes and homes for the aged, or their equivalent, places persistent, exorbitant demands upon many communities for additional general hospital beds and drives up the costs of hospital care. The lack of high-quality institutions to serve the aging population thus denies good hospital care to thousands.

According to the first estimates of the U. S. National Health Survey, about 1,800,000 men and women over 65 years are unable to carry on their normal family and vocational activities because of chronic conditions. I do not imply that all of these should be in nursing homes or homes for the aged. But among them are many whose families cannot afford skilled care at home, many who are eking out a lonely, marginal existence, and many whose illness contributes to dependency because an employed member of the family must give up a job to care for an invalid. We have reason to be disturbed about the dollar price of our neglect of health services for the aged; it touches everyone's pocketbook.

Personal Concern

More important, we care about people. The past 20 years have dynamically changed the whole fabric of our society. But another sort of change, hard to define and springing in part from these dynamic processes, is becoming widespread. It might be called the depersonalization of society. Industrial automation and its counterparts in family life have removed large segments of the population from direct participation in basic communal activities. Decisions affecting the entire population are made by a relatively few people far from the local community. As cities absorb neighboring rural areas, distances from residential areas to the center of community decision increase. The migration to the suburbs is depriving the central city of much of the personal concern of its leadership. Not only in metropolitan areas but in the burgeoning smaller cities communi-

functions tend to become concentrated in the hands of a few.

This aspect of depersonalization should be a

continuous warning light to the health and welfare professions. In making community decisions leaders in these fields should be severely

Nursing Home FACTS

TYPES OF HOMES

Proprietary. Operated under private, commercial ownership.

Public. Operated under State or local governmental auspices.

Voluntary. Operated under private, nonprofit auspices, such as church and other groups.

Skilled nursing. Provides as its primary function skilled nursing care, including procedures which require technical nursing skill beyond that of the ordinary untrained person.

Personal care (with skilled nursing). Provides some skilled nursing care, but only as an adjunct to its primary type of services.

Personal care. Provides such personal services as help in walking, getting in and out of bed, bathing, dressing, and feeding and supervision of self-administered medications.

Shelter. Provides room, board, and minimum services of a domiciliary nature such as laundry, personal courtesies, and occasional help with tasks such as shopping and correspondence.

THEIR NUMBERS

There are an estimated 25,000 nursing homes and homes for the aged in the United States.

They contain 450,000 beds, 180,000 in skilled nursing homes, and 80,000 in homes that provide some skilled care.

Ninety-one percent of the nursing homes are privately owned; three percent are publicly owned. The publicly owned homes have 15 percent of the beds, an average of 69 each; privately owned homes average 18 beds each.

Nursing homes are licensed by every State and Territory except Puerto Rico and the Virgin Islands; only Puerto Rico, the Virgin Islands, and South Carolina do not license homes for the aged. State agencies responsible for licensure programs are:

| Type of agency | Nursing homes | Homes for the aged |
|--|---------------|--------------------|
| State and Territorial health departments | 42 | 34 |
| State welfare departments | 6 | 14 |
| Other State agencies | 3 | 2 |
| None | 2 | 3 |
| Total | 53 | 53 |

The demand for nursing homes is growing. At present 15 million Americans are more than 65 years of age, and by 1975, there will be 19 million. The control of infection, higher standards of living, and improved medical and hospital care are contributing to the longevity and growth of the population of oldsters.

THEIR RESIDENTS

Nursing home residents have an average age of 80 years; two-thirds of them are more than 75 years old. Two-thirds of them are women. Two-thirds have some circulatory disorder. Less than half can walk alone. About one-third are incontinent. More than half have periods when they are disoriented.

Their care costs an average of \$150 monthly. Public funds pay for the care of 50 percent of nursing home residents, and public assistance payments range from \$55 to \$155 per month.

These definitions and data were obtained from Public Health Monograph No. 46, *Nursing Homes, Their Patients and Their Care*, by Jerry Solon, Dean W. Roberts, Dean E. Krueger, and Anna Mae Baney, 1957.

self-critical lest we fall into the delusion that we are the community.

A major contribution of this conference can be to lift the deadening hand of depersonalization from planning and programs for the aging throughout our country. In doing so we would release the most powerful force that mankind has developed, the force of human affection and personal concern.

To do this, we need to touch base with the realities of the problems we hope to solve; to draw upon the experience of the frontline workers in our midst.

I come back to the little old lady in the nursing home. By keeping her in the center of our thinking, we find that the patient is often the first obstacle. Don't think she wears a halo. A person so resistant to change is not easy to help.

Many older people seem to withdraw progressively from the world around them. Their perception of themselves and others and their responses seem to grow less acute. When illness comes, the benefits of medical, psychological, and social treatment are more difficult to achieve. The family may also be an obstacle to better care and better health of an older person.

The community, however, is the greatest obstacle to better care and better health of the aging in these homes. By its collective attitudes and its resistance to change, the community places these institutions in the same withdrawn situation that characterizes so many of their residents. The community has allowed the remarkable scientific and technical advances of this century to bypass nursing homes and homes for the aged.

Deeply rooted in the community consciousness is the age-old dread of institutions. In the 19th century the hospital, as well as the nursing home, the county farm, or the old folks home, was a place for the sick poor to go to, and die. Advances in medicine, psychiatry, sociology, architecture, equipment, and personal services have revolutionized the community general hospital and made it a place where all classes go, and live. These advances are applicable to the nursing home and the home for aged, as many existing institutions have demonstrated.

Our main task is to find ways that will make all nursing homes and homes for the aged places for all classes to go and live.

State and Local Progress

Despite overwhelming handicaps, the State and local official agencies that license nursing homes and homes for the aged are making great progress. But there is much more progress to be made. Moreover the official agencies alone cannot improve the operation and the quality of patient care in these institutions.

Primary responsibility for the licensure of nursing homes and homes for the aged rests with the State health department in most States. Moreover the health departments are usually consulted in the States where some other department handles licensure. Within the State health departments, however, administrative patterns for licensure vary. But the majority of the departments have the same overall program director for both licensure and Hill-Burton programs. Usually the licensure unit itself is a small section within a division of the health department. It calls on other parts of the State health department for such services as public health nursing, nutrition, environmental health and safety, and chronic disease.

The licensure of hospitals and the licensure of nursing homes and homes for the aged are handled by separate units in most States, although an increasing number of States are combining their functions in one division.

State agencies are delegating more and more functions to local agencies when the local unit can handle them. States with strong local health departments find that decentralization is effective and that activities relating to the homes can be integrated into regular public health programs.

Other States hold that decentralization to the regional level is best, and some carry on all activities from the State level. Others are still

This summary is based on a paper presented by Bruce Underwood, M.D., consultant in nursing homes, Chronic Disease Program, Public Health Service.

experimenting and trying out various plans. Some understaffed local health departments do not have time to give to programs for the homes. However, it is my impression that whenever local health departments have a major role in these programs, progress is greater. The picture is similar in the States where welfare departments have the licensure function.

There is wide variation in the types of personnel who actually do the inspections and consultations and carry on the programs. The background of these people may be primarily environmental health, architecture, engineering, medicine, nursing, or a combination thereof. Few State licensure agencies have adequate staffs. Consultation services available from or through the agencies are usually meager.

Inspection procedures also vary. In one State, 7 to 9 inspectors from separate agencies must visit the nursing home before a license is issued. In most, one person inspects for the official licensure agency and another for the official fire safety agency. The inspecting agencies usually work well together and with interested voluntary and professional groups, but in a few States there is little cooperation.

Educational Approach

Perhaps the most important trend among the official agencies is the use of the educational approach rather than the big stick of law enforcement. In one county with long experience in licensing, the official inspectors or consultants have good relationships with the homes. Persons who want to open homes are helped if they can meet the standards, discouraged if they cannot. Homes are approached with these questions: How can we help you? What can we do for you? What are your problems? How can they be met?

This county once had a number of homes that didn't comply with the standards. At informal hearings with the administrators of these homes, laws and standards were not emphasized. Rather patients' needs were stressed, a list of necessary items were agreed upon, and a timetable and priorities were established for the most urgent needs. In this way, the homes, agencies, professions, voluntary agencies, and the nursing home administrators came to under-

stand, support, and cooperate with each other. Together they received the all-important backing of public opinion and public understanding as well as the support of appropriation agencies.

This educational approach is being used increasingly all over the Nation. Where it prevails, the State nursing home associations usually want higher standards, stricter enforcement, and more consultative assistance than the official agency can give. In some areas cooperation is so close that official personnel are difficult to distinguish from those of the voluntary agency. Statewide and regional seminars and institutes are jointly planned and conducted.

Signs of the Future

Nursing home laws and regulations are being revised and standards are being raised all over the Nation. The Public Health Service is assisting official agencies by providing consultation of various kinds and making available instructive handbooks. Various laws and regulations on nursing homes and homes for the aged are being compiled. Also under way is the development of definitions and principles for the States to use as a guide for their nursing home laws and regulations.

Some new, exciting developments are indications of the future. In Peoria, Ill., under a project of the Illinois Public Aid Commission, workers have been trained and are visiting nursing homes to teach aides physical and occupational therapy and rehabilitation techniques.

The outlook of the staff in the homes is changing. One of the attendants in one of these nursing homes was asked, "What do you think of this program?" She answered, "It makes me feel good down in my heart." The administrator of that home said, "Our home will never be the same. People are being rehabilitated and returned to self-help at home or in a foster home at the rate of five or six a month."

Efforts are being made in at least one State to set up accreditation programs for nursing homes in addition to licensure. Others are studying operating costs and personnel time. Some States are experimenting with increased payments to nursing homes to employ physical

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plans should include arrangements for ready transfer of patients into the hospital and back again as their needs dictate, with full exchange of medical and related information. Arrangements may also be made for bringing the benefit of the hospital's resources to the patient while he is in the home, through use of the hospital's laboratory, radiological, and other direct services, and through consultative services to the patients and the staff by the medical, dental, nursing, dietary, physical therapy, social, and other staffs of the hospital.

7. There is a trend toward establishment of nursing homes under the jurisdiction of hospitals. This is one among many other arrangements for achieving closer relationships between nursing homes and hospitals. This trend should be encouraged, particularly for the benefit of certain types of patients for whom close and continuing medical supervision is most essential.

8. Older people who are ill have changing needs, ranging from full hospital care to assistance in personal care. For those who are not in need of hospital services, the remaining range of services may be provided within a single facility or in several different types of facilities. It is the community's responsibility to assure the availability of

these services and to make possible the ready movement of patients among facilities according to their needs.

9. Voluntary classification and accreditation of nursing homes and homes for the aged have the potential for upgrading standards of care beyond minimum acceptable requirements of licensing programs. It is important that appropriate mechanisms for such an accrediting and classification process be developed.

10. The beginning efforts toward correcting the lack of training of health personnel in the problems of care of chronically ill and aged persons are commended. Extension of undergraduate and graduate education programs in this direction is strongly urged for all professions contributing to care. Nursing homes and homes for the aged should be utilized in such educational programs as appropriate clinical teaching facilities.

11. There is a great need for research and investigation into the many complex problems associated with nursing homes and homes for the aged. Emphasis should be given to expanded programs of study and experimentation directed toward improvement of administration, to provision of health, social, and related services, and to financing of these services and facilities.

ministrators of nursing homes and homes for the aged concerning their programming of medical care.

4. For maximum benefit to patients in nursing homes and homes for the aged, it is recommended that:

- Each patient have his own personal physician and be under continuous medical supervision.

- Every patient have a medical and social evaluation prior to or at the time of admission to establish a specific plan for care and that this evaluation be made a part of the patient's record in the home.

- Every home have an organized plan for the medical care of its patients.

- The frequency of physician visits rests with the personal physician and should be based on the needs of the particular patient.

5. It is recommended that general hospitals and nursing homes cooperate in the development of integrated programs for care of long-term patients.

6. It is recommended that there be further exploration of the development of nursing home facilities as integral units of general hospitals.

7. Colleges of nursing should be encouraged to develop regional conferences on nursing administration in nursing homes and homes for the aged in the various States in cooperation with nursing home associations and State health and welfare departments similar to the pilot project conducted in Pennsylvania, December 9-13, 1957.

8. Nursing services in skilled nursing homes should be under the supervision of a registered professional nurse.

9. Personal care home groups should, as a minimum requirement, have their nursing care supervised by a trained, licensed practical nurse.

10. It is recommended that curriculums in nursing education be enriched to include clinical practice in chronic illness and administrative practice in chronic illness facilities.

11. Since personnel policies have a direct effect on recruitment and retention of qualified personnel, it is recommended that clear, written

Selected Professional Services

1. In order to insure proper placement of the nursing home patient in the facility best suited to his needs, it is recommended that a system of classifying patients be developed which considers diagnosis, type and degree of disability, potentialities for rehabilitation, and medical, nursing as well as other professional service requirements. A beginning has been made in several localities toward developing such a classification, but it is felt that further research is required to refine, improve, and test such a classification system.

2. Every home should have some organized plan for medical supervision in keeping with its size and needs. It is recommended that

every nursing home operator select at least one physician to act as principal medical adviser to advise on medical administrative problems, review the home's plan for medical care, and handle emergencies if the patient's personal physician is not available.

3. The adequacy and effectiveness of medical supervision depend in part upon the relationship that exists between the home operator and the local physicians. Recognizing the need for continued improvement of this relationship, it is recommended that the American Medical Association Committee on Aging continue its efforts to bring about the formation of State and local committees on aging to advise ad-

therapists and occupational therapists to return people to self-help whenever possible. They are finding this program to be more economical in the long run, to say nothing of the humane factors involved. There are many other new developments and activities taking place in our Nation.

The philosophy behind these omens of the

future has been expressed by Dr. Albert L. Chapman, Division of Special Health Services, Public Health Service, in these words, "The hallmark of civilization is a voluntary commitment of time and money to make sure that oldsters, youngsters, and the infirm are not denied whatever benefits and privileges a humane society can endow them with."

Conference Recommendations

General Policy Questions

1. Nursing homes and homes for the aged are and should continue to be administered under public, voluntary, and proprietary auspices. All have a part to play in providing facilities of good quality. In any particular instance, the most desirable sponsor of a facility from the community's point of view is that one which will provide the best quality of care economically.

2. To clarify the functions of nursing homes and homes for the aged, the following fourfold classification of services is recommended. Each successive category encompasses the preceding category and goes beyond to the extent indicated. Homes, whatever their names and auspices, may be characterized according to the level of services provided in these terms of classification.

Services

The descriptions only convey the essential differences among the categories. This should not detract from the necessary focus in each of the categories on the social, emotional, and spiritual needs of the residents as part of providing opportunity for a satisfactory total pattern of living.

Residential services. Encompasses housing, food services, and limited services of a domiciliary nature such as laundry, personal courtesies, occasional help with correspondence or shopping, and an occasional helping hand short of

routine provisions of "personal care."

Personal care. Includes such personal services as help in walking and getting in and out of bed, assistance with general bathing, help with dressing or feeding, preparation of special diet, supervision over medications which can be self-administered, and other types of personal assistance of this order.

Nursing care. Includes services in caring for the sick which require technical nursing skills.

Comprehensive services. Extends the types of care outlined above to emphasize, in addition, social and group-work services, auxiliary medical services and rehabilitation (including psychiatry, physical medicine, and occupational therapy). This multiplicity of services provides full opportunity for a rich, well-rounded living experience in its social and psychological aspects as well as medical and nursing aspects short of hospital care.

Facilities

Corresponding to this classification of services, the following terms are recommended as designations for understanding the type of home, whatever its given name. These types are the residential facility, personal care facility, nursing care facility, and the comprehensive services facility.

It should be recognized that any type of facility need not confine its services to its residents. It may also be open to persons living out-

side the facility who come in for a portion of the day to use its services.

3. Comprehensive planning at the local level should be done in developing new facilities, utilizing existing planning agencies where such exist, or creating a medium for this purpose. Community planning for new facilities should take into consideration the availability of services to assist in care of patients in their own homes.

4. For those persons who can and wish to be cared for in their own or family homes, this "natural" home usually provides the most desirable environment. To help maintain this environment, the community should make available enabling resources such as visiting nurse services, homemaker services, day centers, foster homes, meal-delivery services ("meals-on-wheels"), and so forth. For those persons in this category who are in financial need, the community should provide adequate financial assistance.

5. Government, through its public welfare programs, is in a position to influence the quality of nursing home care. By its frequently inadequate payments for public assistance recipients in nursing homes, government denies to many patients adequate care while it perpetuates the operation of homes at a sub-standard level. Government should provide payments for public assistance recipients in nursing homes in amounts sufficient to assure provision of adequate care.

6. The development of planned cooperative arrangements between hospitals and homes for the aged and nursing homes should be widely and energetically promoted. Such

cost and cultural demands of the patients and residents in the homes.

2. The food service in nursing homes and homes for the aged should meet the nutritional needs of the patients and residents through foods. Nutrient concentrates should be given only on the prescription of a physician.

3. Any processed foods served in nursing homes and homes for the aged should be processed by safe and approved methods.

4. The licensing agency should provide ways and means of making it possible for nursing home administrators to put into practice a food service which will meet the Recommended Dietary Allowances. This will involve information on selection and use of kinds and amounts of foods at varying cost levels and use of qualified personnel and/or authoritative materials. Some sources of personnel and materials are official and nonofficial health and welfare agencies at national, State, and local levels; colleges and universities with home economics departments; hospital dietitians and dietetic associations; and Federal, State, and local departments of agriculture and extension services.

5. At least 3 meals per day should be provided with not more than a 14-hour span between a substantial evening meal and breakfast.

6. Food should be prepared in ways that conserve the nutritive value, and it should be suitably cooked for the digestive capacity of the groups served. The food should be served in a manner that will be acceptable to the patients and residents.

7. Table service for the individual or group should be available to all those who can and will eat at a table. Table service should be provided in a manner that will best serve the interests of the patients.

8. Because of the therapeutic value of getting the patient up for meals wherever possible this practice should be followed, whether or not it would affect the classification of the patient or the rate charged.

9. The entire licensing staff of the regulatory agency should be familiar with the criteria for evaluating

the food service and the specific assistance for food service which may be provided to the operator of the home.

10. The licensing agency should assume responsibility for education and training in all phases of food service for all personnel in nursing homes and homes for the aged. Such education and training should include individual and group conferences, on-the-job training, and formal training. Qualified personnel from the following sources could be used: health and welfare agencies, home economics departments of colleges and universities, hospital dietary departments, and departments of vocational education. New and prospective employees in nursing homes and homes for the aged should be included in such programs.

11. Formal training of professional workers concerned with care

of patients and residents of nursing homes and homes for the aged should emphasize geriatrics and especially geriatric nutrition. Furthermore, this recommendation should be relayed to the appropriate organizations and groups responsible for its implementation.

12. Regulations should require that there be made available for review the menus as served, a record of kinds and amounts of food used for a given period of time, and the number of people served during this period.

13. A national project should be conducted to develop a cost accounting system specifically for nursing homes and homes for the aged.

14. Further studies of the nutritional requirements of the aged person in nursing homes and homes for the aged should be encouraged; this recommendation should be referred to properly equipped research laboratories.

Social and Related Services

1. It is recommended that as a basis for sound medical, social, and personal planning for the older individual, there be the recognition that he be enabled through coordinated community efforts and services to remain in his own home as long as this is consistent with his health and welfare.

2. It is recommended that ways be developed to provide information about services and resources to guide the aged and their families to the appropriate service or resource which may best meet their needs. These informational resources could be central referral services, brochures, booklets, and/or other media.

3. It is recommended that in the interest of mobilizing and making available all community resources for the evaluation of the older individual and his needs, emphasis should be placed on the importance of the development and coordination of consultative services at Federal, State, regional, or local levels.

4. It is recommended that the team approach be used in evaluating the individual's health, social, and other related needs, including the involvement of the older individual

and his family in order to do the best possible planning to meet his needs and those of his family.

5. It is recommended that in all applications for institutional placement, the total assessment of the older person's needs and the resources available to meet those needs, be required prior to actual placement in any institutional setting.

6. We recommend acceptance of the basic premise that persons living in institutions have a right to live as fully as possible within the limits of their abilities and within the limits imposed by the group setting. To achieve this end, full utilization of all social and related services of the community is essential.

7. We recommend continuous consultation on social and related services by both regulatory and other public and voluntary agencies to all institutional facilities for older people.

8. We recommend that professional schools include in their curriculums content material emphasizing the social and emotional needs of older people. Professional schools, colleges, universities, and other com-

personnel policies be developed by nursing homes and homes for the aged, including job descriptions, plans for orientation of new staff and provision for inservice education. It is suggested that the American Nursing Home Association give consideration to the development of suggested personnel policies for nursing homes.

12. It is recommended that appropriate groups undertake research projects in nursing homes and homes for the aged to develop criteria for classifying patients according to nursing needs, the levels of nursing personnel required to meet these needs, and the educational programs desirable for each type of personnel needed to provide these services.

13. State licensing agencies should include professional health consultation services for nursing homes and homes for the aged.

14. It is recommended that a study be made to determine the requirements of nursing homes and homes for the aged with relation to supply, availability, storage, dispensing, and supervision of administration of medications. This study should consider providing medications for acute, chronic, and maintenance needs with due regard for all legal and medical requirements.

15. Medication and its administration should be based on the plan of medical care for the patient and the level of nursing services available.

16. Comprehensive dental care has not been readily available to many residents of nursing homes, especially to those in smaller institutions. In most instances, dental treatment has been limited to emergency care for the relief of pain.

Therefore, to stimulate interest in oral health and to improve the quality and quantity of dental care in nursing homes, the following actions are recommended:

- Dental evaluation of patient on admission to be included in the patient record.

- A principal dentist and/or an advisory committee to nursing homes and homes for the aged should be appointed from the appropriate dental society.

- The dental staff of the community hospital or hospitals should organize a liaison committee with the administrators of nursing homes and homes for the aged for dental consultations and service.

- The dental division of the public health agencies should establish a consultant service to nursing homes and homes for the aged.

- The curriculum in dental schools should include instruction in problems of caring for the chronically ill and the aging.

- Research should be conducted to establish dental needs, necessary portable equipment, and appropriate treatment procedures.

- There should be representation of the dental profession on planning committees for nursing homes and homes for the aged.

17. It is recommended that refresher courses and inservice training on dietary service be provided to personnel responsible for inspection of nursing homes and homes for the aged.

18. It is recommended that to meet more adequately the individual needs of patients in nursing homes and homes for the aged, established community agencies jointly undertake a plan whereby specialized professional services in the community are made available to patients in these facilities. Such services might be made available by voluntary or public agencies or both. Services should include occupational, recreational, and physical therapy, and social, nutritional, X-ray, laboratory, pharmaceutical, and dental services. Specific patterns for providing these services will depend on the local situation.

19. It is recommended that central referral and counseling services for the chronically ill and the aged be developed on a community or regional basis with provision for outposts in surrounding local areas.

These services should be provided by skilled professional personnel.

20. Public assistance agencies with support and cooperation of professional and other interested groups should make the utmost effort, as part of their responsibility for providing care for indigent persons, to obtain public funds adequate to provide the recommended services.

These services should be furnished to all patients on the basis of their needs, without regard to the source of financial support or the type of ownership of the institution.

21. One objective of the nursing home is to promote optimal physical and emotional health and to restore and return to his community every individual who has a potential for such restoration. Therefore, it is recommended that:

- Efforts be made to develop within the nursing staff techniques and skills in counseling and in restorative services and to utilize these so that the patient will not remain bedridden unnecessarily.

- Nursing homes adopt a program of restorative care that can be accomplished through a combination of direct services by the staff or by personnel services provided by other community agencies and consultation services. Personnel used for such services should be individuals with recognized professional qualifications who function under specific medical directions.

- The therapist should be a graduate of a school approved by the American Medical Association's Council of Medical Education and Hospitals, and State licensed or registered, if required by the State.

- Those patients with severe disability and rehabilitation potential beyond the capacity of the nursing home should, when possible, be referred to a rehabilitation facility.

Nutrition and Food Service

1. The nutritional needs of persons in nursing homes and homes for the aged should be met in accordance with the National Research Council's current Recommended Dietary

Allowances adjusted for the population concerned.

It is recognized that these allowances may be met by many food combinations designed to meet the

grams of self-inspection of members' facilities, and

Whereas in facilities where unsatisfactory conditions are found to exist the several State associations do take appropriate action to have such conditions corrected and when this fails deny or revoke association membership, and

Whereas this program of self-inspection is most beneficial to the welfare of the patients as well as the financial success of the individual nursing home,

Therefore, State nursing home associations are commended for their programs of self-inspection and are urged to continue and strengthen their procedures for corrective action in the case of members who continue to willfully and flagrantly fail to carry out the objectives of good nursing care of the nursing home association.

9. Whereas it is the total care given to the nursing home patients which is of paramount importance to the nursing home operator, the general public, and the State and local agencies responsible for the inspection and licensure of nursing homes and nursing home operators, and

Whereas the development of a mutual understanding between the official agencies and the members of the nursing home industry for the ultimate attainment of an acceptable level of care in nursing homes and a better understanding of the problems involved in this rapidly increasing community responsibility, and

Whereas this goal would be attained more readily if the staff members and the directors of the official agencies responsible for the inspection and licensure of nursing homes were given an opportunity to approach their problems on a more definite and uniform basis, a better relationship could be established with the operators and agencies responsible for providing patient care,

Therefore, it is recommended that the Public Health Service undertake to establish regional meetings to train such public agency personnel, and to secure some financial aid for personnel selected to attend such training meetings.

10. Whereas nursing homes and homes for the aged have a real and vital concern with the process of aging, and

Whereas there is proposed a White House conference on aging,

Therefore, it is recommended to the U. S. Department of Health, Education, and Welfare, and to such other agencies as may participate in structuring a White House conference on aging, that the assistance of representatives of nursing homes and homes for the aged be actively sought in developing plans for the conference.

11. Whereas the thermal, acoustical, and illumination characteristics of environment have a direct bearing on the health and safety of the aged in both private and institutional homes, and

Whereas there exists today no recognized qualitative or quantitative criteria for the design of the opti-

mum environment for the aged, in terms of thermal, acoustical, and illumination factors,

Therefore, it is recommended that the Public Health Service foster the development of study and research programs leading to a better understanding of these important environmental factors and to the development of criteria which may serve as a basis for sound environmental design.

12. Whereas the proper care of the aged is a major and growing problem facing the United States today,

Therefore, it is recommended that the American Medical Association, American Hospital Association, American Nurses' Association, American Dietetic Association, American Nursing Home Association, and other groups interested in the total problem coordinate their efforts in order to bring about maximum benefits to our aging population.

Regulatory Agency Problems

1. This conference should endorse the action of the Association of State and Territorial Health Officers, November 2-8, 1957, which has formally requested the Public Health Service to collaborate with other groups having interest in the field of medical care facilities to establish classifications and definitions of such facilities.

2. The Public Health Service should be asked to develop a model law, rules, and regulations for nursing homes and homes for the aged.

3. The model law, rules, and regulations should provide that:

- each patient have his personal physician, a physician be available at all times for emergencies, and medical advice be available to the administrator;

- physical examinations be required within 48 hours of admission date and periodic examinations be made thereafter;

- the regulatory agency will specify the required records on a current basis, including identifying and socioeconomic information, records of physical examinations, and other continuing medical records.

4. The model licensure law

should include provision for an advisory committee to the regulatory agency composed of representative professional and interested groups, official and voluntary in the State concerned.

5. In drafting the model law, attention should be given to the human factors, for example, personal interest, dignity, and privacy in patient care.

6. The law, rules, and regulations should include initial and continuing evaluation of physical, mental, financial, educational, and moral qualifications of applicants for licensure to operate or manage nursing homes and homes for the aged.

7. It is recommended that in nursing homes sufficient personnel be on duty and awake at all times.

8. It is recommended that the Public Health Service undertake a study of the requirements for the staffing of nursing homes and homes for the aged.

9. It is recommended that the agency best qualified to provide the following functions should be the responsible regulatory agency: set standards for safety, environmental

munity agencies should be encouraged to offer institutes and other inservice training programs with similar content for institutional personnel and others working with older people.

9. We recommend that in every community there be a responsible group, such as the regulatory agency, council of social agencies, or other special group whose function it is to evaluate and interpret to the public the human values as well as the costs of social and related services. Evaluation and interpretation are

necessary if sufficient funds are to be secured and the best possible utilization of these funds is to be assured.

10. We recommend that studies be made by qualified individuals or agencies (voluntary or public) to develop minimum standards for the amount and types of social and related services required by the older person in a crisis and for his long-term requirements. These standards should be related to the size and type of community in which the older person lives.

Environmental Health and Safety

1. Whereas it is the consensus that fire protection in nursing homes for the aged is of paramount importance,

Therefore, it is recommended that the States adopt, as minimum requirements for life safety in these establishments, the current National Fire Protection Association Standards pertaining to nursing, convalescent, and old age homes, and that each State establish a deadline date for the adoption of these standards.

2. Whereas the importance and the use of automatic fire sprinkler systems in all nursing and rest homes and other structures housing the aged and infirm is recognized, and

Whereas it is especially important that such installations be made in rural locations not served by water mains, and

Whereas it is recognized that the installation of sprinkler systems and other safety to life measures present a problem of increasing operating costs, and

Whereas the majority of the patients housed in nursing homes are supported by the community and other public sources,

Therefore, it is recommended that the communities and their legal representatives recognize their responsibility to the aged and infirm to provide funds that will permit the installation of such equipment as necessary safety elements in the adequate housing of such patients.

3. Whereas there is not available

a compilation of all State and local laws, rules, regulations, and methods of enforcement in regard to nursing homes, and

Whereas such information would be of great value as a basis for discussions of standards and for assisting State and local groups in the development of standards,

Therefore, it is recommended that the work of the Public Health Service now being carried out in the compilation of such data be continued and extended to include laws detailing fire prevention and control, and that such a compilation be published and made available to interested groups.

4. Whereas innumerable active and prospective nursing home operators are acquiring or attempting to modify unsuitable facilities,

Therefore, it is recommended that all available means of publicity be utilized by all interested persons or organizations to acquaint the general public with the free consultation services offered by the individual State licensing agencies, and that a compilation of all such consultation services by any governmental or other agency be published for distribution by the U. S. Department of Health, Education, and Welfare.

5. Whereas the dissemination of information among the participants of this nursing home conference has proved most valuable in creating sympathetic understanding of common problems, which gives promise of practical approaches to the solu-

tion of some of these complex and difficult problems, and

Whereas this kind of transmission of information and development of understanding is most urgently needed at local levels where the facilities are being operated and where the laws are being applied,

Therefore, it is recommended that the Public Health Service continue and extend the sponsoring and development of regional conferences at the local level throughout the country, to which are invited personnel representing local groups similar to those participating in this conference and including agencies and organizations having an interest in the regulation of or services to nursing homes, as well as those agencies and organizations providing financial support for individuals cared for.

6. Whereas employees' fire safety training programs are required of hospitals for accreditation, and

Whereas the fire hazards in nursing homes and homes for the aged are generally similar to those existing in hospitals, and

Whereas the universal adoption of fire sprinkler systems is still in the future,

Therefore, it is recommended that this conference advocate that nursing homes and homes for the aged institute employee fire safety training programs.

7. Whereas accident prevention programs and specific procedures designed to avoid accidents in nursing homes and homes for the aged are restricted by a present lack of substantive information,

Therefore, it is recommended that the Public Health Service make known this general situation and advise qualified investigators that morbidity and mortality studies of nursing home accidents will be considered for National Institutes of Health research grants and, further, that State health departments, municipal health departments, medical schools, and schools of public health be specifically contacted in this regard.

8. Whereas several State associations of nursing home owners now operate desirable and effective pro-

ordinating services; reporting to the board, the public, and the clients; and budgeting.

2. All nursing homes and homes for the aged, whether nonprofit, proprietary, or public, should have a governing board or advisory committee. In some communities it may be more practical for several homes to utilize one committee.

3. Ways and means should be found for encouraging the conduct of active education programs for board and advisory committee members on their functions and responsibilities.

4. Every nursing home or home for the aged should have a medical adviser or medical advisory group. It should be the responsibility of the administrator to initiate the action for establishment of such advisory service, preferably utilizing a local general hospital. If there is no general hospital within easy access, liaison should be worked out with the medical profession through the county or State medical society.

5. A person who becomes an administrator of a nursing home or a home for the aged should be licensed to do so by a properly designated regulatory agency. Such a person should possess a personal motivation to provide or obtain suitable patient care, possess the customarily required moral qualities, and have the following minimum qualifications to merit a license:

- Graduation from an accredited high school or equivalent training.

- Successful completion of a prescribed course of training presented by a recognized educational agency. The content of the course may be planned in cooperation with pertinent professional organizations and approved by the regulatory agency. In any jurisdiction enacting legislation along this line it is expected that suitable training facilities be organized to make feasible the procurement of such training.

- A minimum of 6 months' professionally supervised experience in a recognized medical care facility

which would provide background and experience in institutional management, human relations, and ethical practices.

- For one currently functioning as an administrator of a nursing home and/or home for the aged it is further recommended that upon the establishment of a licensure program a grace period of not more than 3 years be extended as a reasonable period of time for such a person to acquire the additional training necessary to qualify for licensure. A specified number of years of appropriate experience could be accepted by the regulatory agency in lieu of this requirement.

- It is recommended that persons currently functioning as administrators of nursing homes or homes for the aged be immediately screened by a testing process designed to disqualify for such a position those who cannot demonstrate adequate ability to read and understand the regulations and literature pertinent to the operation of such institutions.

6. Every nursing home and home for the aged should have a homelike, cheerful, friendly, and hopeful atmosphere that will contribute to the promotion and preservation of the personal integrity of each individual. The home should make available and utilize those services necessary for the emotional, physical, social, and spiritual enrichment of the patient.

This would require properly trained personnel to provide: personal care including food, shelter, and personal hygiene; medical and nursing care, and rehabilitation and optimum health; social, emotional, and spiritual well-being.

Personnel should be selected on a full-time or a part-time volunteer basis to meet these needs. It is recognized that the size, location, and type of home would determine the variables in the staffing pattern of one home compared with another.

The administrator should have a knowledge of the necessary skills

and education, as well as the legal requirements for the successful performance of the services to be rendered.

In the selection and engagement of personnel, the administrator should give consideration to the individual applicant's physical, mental, and emotional qualifications for work with the resident "to help the patient to do as much as he can as well as he can as long as he can." He should try to instill in all of his staff a sense of dignity and worth as members of the team of the nursing home or home for the aged.

Personnel practices, methods, and procedures should be explained to staff members in the most effective way possible so that they will be apprised of their functions in the operation of the home. General policies under which the home operates should be written and available to all employees at all times.

7. The administrator of a nursing home and home for the aged should be responsible for determining the qualifications and suitability of each prospective employee for the job he is to perform.

8. Prospective employees should have a preplacement health examination.

9. Every administrator should provide opportunity for the growth and development of staff, professional and nonprofessional, through training either within or outside of the home. Such inservice training may be provided separately or in cooperation with each other by: nursing home associations, State welfare and health agencies, universities, professional organizations, hospitals and related institutions, and other voluntary agencies.

10. There should be uniformity of business and accounting practices in order to establish a basis for charges to patients and agencies purchasing patient care and for better planning and programming.

health, and patient care; carry out and coordinate inspections; give consultation and planning services; and furnish teaching.

10. It is recommended that a single agency have primary regulatory responsibility for all medical care facilities and homes for the aged.

11. It is recommended that there should be provision for the exchange of information between regulatory and other agencies which would enable all concerned to carry out their responsibilities.

12. It is recommended that State regulatory agencies arrange inter-agency meetings for workers within a State.

13. It is recommended that adequate funds be made available for research and demonstration projects by State and local agencies with monies furnished by Public Health Service, the States, or other agencies.

14. It is recommended that the appropriate body or bodies should: study staffing needs, qualitatively and quantitatively, of State regulatory agencies including full-time and borrowed services; survey the resources available for education and training of personnel; and prepare a plan to supply education and training not currently offered.

15. It is recommended that the appropriate body or bodies should: study training needs, qualitatively and quantitatively, for administrators of nursing homes and homes for the aged; survey the sources available for education and training of personnel; and prepare a plan to supply education and training not currently offered.

16. It is recommended that the Public Health Service be requested to collaborate with State agencies and other interested groups to collect statistical data at least annually, regarding nursing homes and homes for the aged.

17. It is recommended that there be regional meetings similar to the National Conference on Nursing Homes and Homes for the Aged.

18. It is recommended that regional meetings be held by the

Public Health Service, working with State agency personnel giving direct service of all kinds in the area of patient care.

19. It is recommended that the Public Health Service and the State agencies prepare additional guidance materials for dissemination to

administrators of nursing homes and homes for the aged.

20. It is recommended that the Public Health Service collect pertinent material developed by State regulatory agencies and all other agencies and disseminate such information.

Financing of Facilities and Services

1. There is need for Federal legislation to further encourage financing for the construction and renovation of nursing homes and homes for the aged, including a set of recommended construction standards for use by the financing agencies when such construction or renovation meets clearly demonstrated local needs. The need for such legislation is so urgent as to require prompt consideration by the appropriate executive and legislative sections of the Federal Government.

In view of the action already taken in certain States in providing funds for housing for older people, it is recommended that consideration be given to allocation of State funds on either a grant or loan basis for the construction of homes for the aged and nursing homes.

Since county and municipal tax funds have traditionally been a primary source of financing institutions for dependent local residents, the possibility of this source for additional financing should also be considered.

2. Since realistic payments cannot be intelligently negotiated without a sound basis of cost, it is recommended that modern accepted accounting methods be adopted in nursing homes and homes for the aged.

Local agencies should be encouraged to determine costs, based on modern accepted accounting methods, related to the kinds and quality of services that can be provided. Public assistance payments should

be established to provide a minimum commensurate with these established costs.

3. It is recommended that the Public Health Service collect and publish good cost data that are presently available concerning the operation of nursing homes and homes for the aged, separated by geographic area, and further subdivided to show various levels of service.

4. It is recommended that health insurers of all types should give earnest study and consideration to the further extension of health insurance to cover care in nursing homes and other institutions performing the functions of nursing homes. The prerequisites for such action should be establishment of the medical nature of the care and specific recommendation of the service by a physician either following hospitalization or otherwise. Consideration should also be given to continuation of existing health insurance policies, regardless of age or health condition of the insured. Welfare departments should continue the payment of health insurance premiums on behalf of people who have health insurance coverage at the time they are accepted for public assistance.

5. It is recommended that States be urged to take full advantage of Federal matching funds for medical care to defray cost of care of public assistance recipients in nursing homes and related institutions providing nursing care.

Administration of Homes

1. Every nursing home and home for the aged should have an administrator who is continuously responsible for the proper operation

of the home. His functions should include planning of objectives and services; organizing staff and facilities; directing, supervising, and co-

the TRANSFORMATION of NA NGOO



INTERNATIONAL MAIL POUCH



Na Ngoo is like tens of thousands of other villages in Thailand. Its 49 families own a few pigs, a scattering of scrubby chickens, and some buffaloes. They use bamboo, palm leaves, and rice straw from the surrounding country to build their houses. Those who can afford flooring timbers raise their houses on stilts, Thai fashion, always with an odd, never an even, number of steps to confuse evil spirits. Their household possessions are essential clothing, a few pots and pans, sleeping mats of woven grasses, and large clay jars for storing a day's watersupply.

Despite the historic agricultural abundance of the country, the people of Na Ngoo, like millions of other farm families in Thailand, battle poor soil, a scarcity of water 7 or 8

months of the year, and the inaccessibility of markets for their rice crops. No more than \$30 or \$40 pass through their hands in a year of back-breaking toil. They cannot afford even a dollar or two for insecticides to prevent the loss of a crop or to build a tank for storing scarce drinking water.

Na Ngoo has no public facilities. Even its water hole, a stagnant pool during the dry season, is a kilometer away. The people send their children to a school nearly 2 kilometers distant because schooling is compulsory for the first four grades, but ignore the district health center, an equal distance away.

Smoking-Mortality Rate Among Veterans

A Public Health Service study among 198,926 United States veterans shows a significantly higher death rate among regular tobacco smokers than among nonsmokers. The first report on the continuing statistical survey was made July 8, 1958, by Dr. Harold F. Dorn, chief statistician for the National Institutes of Health, to the Seventh International Cancer Congress in London. Dr. Dorn is also chief of the Biometrics Branch in the Division of Research Services of the Institutes.

The survey generally supports findings of earlier studies which demonstrated a statistical relationship between death rates and smoking.

Death rates among the group of veterans who were United States Government Life Insurance policyholders were summarized for the period July 1954 to December 1956. The deaths were then related statistically to the smoking habits of the veterans. Clinical and laboratory research were not included in the study.

The initial report covers 7,382 deaths during the 2½-year period. Of these, 6,203 occurred in smokers and 1,179 in nonsmokers. The data was from persons who served in the Armed Forces between 1917 and 1940 and ranged in age from 30 to 90 years. The majority were between 50 and 70 years of age.

The report included the following points:

- The death rate from all causes of persons who used tobacco was 16 per 1,000, compared with 13.1 per 1,000 for persons who never smoked. Adjusted for differences in age distribution between the two groups, the death rate was 32 percent higher for smokers than for nonsmokers.

- Persons who regularly smoked only cigarettes had the highest death rate of all groups of smokers—58 percent greater than the death rate for nonsmokers.

- The lung-cancer rate for regular smokers of cigarettes only was about 10 times the death rate for nonsmokers.

- The death rate among regular cigarette smokers was closely related to the amount smoked. For example, the death rates of persons who smoked more than 40 cigarettes a day were much higher than those of persons who smoked fewer than 10 cigarettes a day.

- The death rate of persons who regularly smoked cigars or pipes, or both, was not significantly higher than that of nonsmokers. Only the heaviest users of cigar and pipe tobacco had an appreciably higher death rate from all causes than nonsmokers.

- Nearly two-thirds of the 6,203 deaths of tobacco users studied were attributed to diseases of the heart, blood vessels, and kidneys. The death rate from coronary heart disease was found to be 63 percent higher for regular cigarette-only smokers than for nonsmokers.

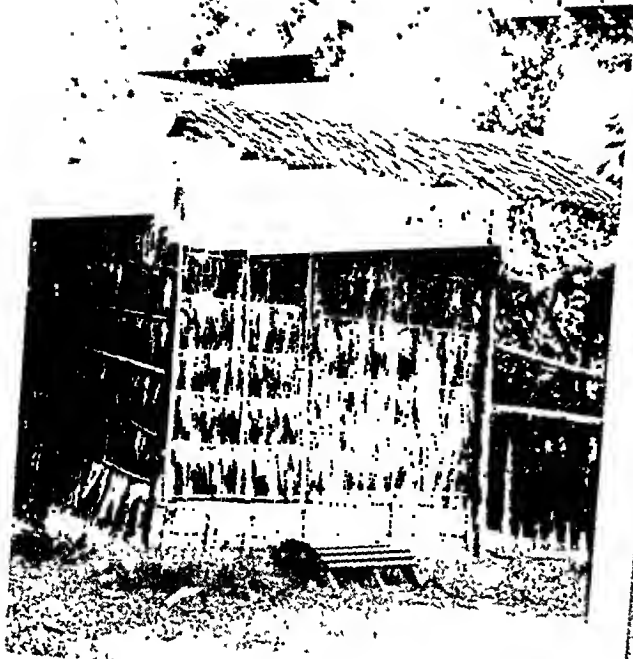
- Regular cigarette smokers who had stopped smoking cigarettes before the study began in 1954 had a lower mortality rate than those who continued to smoke. However, the rate was 30 percent higher than that of nonsmokers.

- Regular cigarette smokers also had higher death rates from certain respiratory diseases, such as bronchitis, pleurisy, and emphysema, from ulcers of the stomach and duodenum, and from cirrhosis of the liver.

- The death rate from coronary heart disease among regular users of cigarettes only is 63 percent higher than the rate for nonsmokers.

In addition to the use of tobacco, the continuing study will also explore possible statistical relationships between death rates and such environmental factors as occupations, work environments, and characteristics of the home communities.

Dr. Dorn's paper is entitled "Tobacco Consumption and Mortality from Cancer and Other Diseases." The study was made possible by the cooperation of the Veterans Administration.



Left: Na Ngoo's privies repudiated skeptics who said they would never be accepted. Even the pigs are well scrubbed. Right: Sitting villager tells sanitarian Nai Chit Chivonge (left) that the new privies saved time which he used to make baskets to sell.





As one of the poorest communities in a fairly prosperous district, Na Ngoo was chosen to be one of a number of village pilot projects in health and sanitation. These projects were designed to find out if even the poorest villages could be induced to change old ways and if the individualistic Thai would work with others on community projects. This was the difficult task of Alexander A. Robertson, American sanitarian, when he began work in Na Ngoo in March 1957.

Three months later, the Public Health Office of the United States Operations Mission in Bangkok got a report from Robertson that 19 sanitary privies were installed in the village and 6 more were planned for completion the next month.

Curiosity drew us to Na Ngoo in early July. Three hours' travel from Bangkok over a fairly good, hard-surfaced road brought us to within a kilometer of Na Ngoo, but we had to make the rest of the way on foot over the rice paddy embankments. Our guides were Robertson, Dr. Khien Kraivichien, director of Cholburi Health Training Center, and Nai Chit Chivonge, sanitarian instructor.

Na Ngoo's health committee meets. Headman (1st left) and school teacher (3d right) are members. Below: Wife pours rice into milling machine.



district health center offered. He explained the advantages and problems of sanitation in the village and urged the people to talk it over. If they were interested, there would be another meeting.

A week later, the head of every family in the village gathered with Nai Chit, Nangsao Vimoon, Robertson, and Nai Thongkam. The villagers agreed that water was their big problem. The nearest supply was a kilometer away, often muddy, and at the height of the dry season, almost nonexistent. They needed more and cleaner water, and, if possible, close by. If the villagers were prepared to undertake a village sanitation program, the officials said, the health center would help them get a safe, dependable water supply and a pump.

But privies would have to come first, because the water cannot be kept clean and safe without them. And after the privies and the water supply, the village needed a general cleanup. All three steps were necessary to health, and all must be agreed to if they were to get help, the officials explained. Help would include cement and forms for making the privy slabs at cost. Payment, roughly a dollar per privy, would be required but not until after the next harvest. Any family that could not afford the cost all at once would be allowed several years to pay.

The heads of the 49 households, with some dissent, agreed to take the three steps and form a health committee.

A few days later, the men and women voted to elect the health committee members. The village was divided into 7 groups of 7 families each, and each group elected a member. The headman of the village and the local school teacher each won a place on the committee of 5 men and 2 women. If Na Ngoo had had a Buddhist temple, the abbot would have been given an honorary place on the committee, but the village is too small and too poor to support a temple.

The committee decided to start the cleanup immediately, while privy sites were selected.

They set Wan Phra, the Buddhist sabbath, as cleanup day, since it was the only day the people were not busy in their fields.

On the first cleanup day only five families worked. The second week seven more families joined them. Each week more and more people worked at the cleanup. Two families held out for almost 10 weeks, but finally they joined too. Whole families, working together, cleaned up their own compounds and then the public places. They dug the privy pits, built the housing over them, and learned to mold the slabs with the sanitarians' guidance. They built their health committee headquarters and dug the catchment and the wells.

We asked one man what part of the work was hardest. With a grin he replied, "Cleaning house," which to him meant cleaning the whole compound around his house as well. It was hardest because he did it every day after he came home, hot and tired from the fields. He didn't limit cleanup to Wan Phra.

He was eager to talk, so we questioned him. "Why is the program good for you?"

"I will make more money," he said.

"You mean save more money, don't you, by not getting sick and not having to spend money on medicines?"

"No. I will make more money. Not spend so much time looking for a place to relieve myself. Have more time to make things to sell."

Meanwhile, Nai Chit and the village committee were discussing something that seemed serious and important. The matter was finally settled with friendly smiling nods by these villagers who people said would never change their traditional easy, careless ways. On the way back to Bangkok we asked Nai Chit about it.

"The committee asked that another privy be built. A family who was sharing one with another would like to have its own. It will be built, of course."

—HARRY L. CARR and MRS. JAY S. BOHLE,
U. S. Operations Mission, Thailand



Left: The old water hole, a kilometer from the village, became a stagnant pool in the dry season. *Right:* Men, women, and children dug the rain catch basin and two wells, separated from the basin by a filter system, to give the village a constant, safe supply of water.

No one expected us, and most of the people were at work in the rice fields. But when we arrived the village looked as if it had been prepared for an inspection.

We hesitated to flick a cigarette ash in the cleanswept compounds. The houses were scrubbed and orderly, with wood neatly stacked. Animal pens were as clean as living rooms and the animals themselves fairly shone; even the hogs looked as if they were ready for a State fair. Buffaloes, customarily sheltered under the stilted houses, were penned under the shade trees.

The privies were the repudiation of skeptics who said they would never be accepted because privies infringe on the Thai's historic right to relieve himself when and where he pleases. Na Ngoo had 33 of them, although 25 would have sufficed with families sharing. Not only were they clean with daily scrubbing and covered with neatly built housing of rush and bamboo, but many had been decorated with fancy grass weaving.

The pride of the villagers was also mirrored in flower and vegetable gardens, growing where none had ever existed before. Women and girls were weaving fly covers to put over food dishes. One woman, who was milling rice, told us the food value of the grain was in the bran, not the white kernel.

Close by was the village's biggest achievement, its new water supply system. Everyone,

even the children, had worked on it. The headman donated a generous piece of land. On it they built a large catch basin and dug wells on either side. Now Na Ngoo's people would not have to walk a kilometer for their water, and their water was cleaner.

Under a huge tree in the center of the largest compound the village health committee built a shelter for its meetings. Adorning the building were colorful posters proclaiming, "Prevention is better than cure."

The health committee felt it was just starting its work. After the catch basin and wells would come a corral for the village buffaloes, to keep flies and manure a safe distance from the houses. Next they planned a community compost pit, a plentiful source of organic fertilizer for the tired land.

"How did it happen?" we asked. Na Ngoo was no hothouse project. Its changes had come from the heart and muscle of the people themselves.

Our three guides and Nangsao Vimoon Thongpoonsak, health educator, and Nai Thongkam Suwarnachitr, district sanitation officer, supplied the initial spark. One evening they pushed their jeep as close as possible to the village and strung a long electric cable from the jeep's generator. They showed an entertaining motion picture and a film on sanitation. Then Dr. Khien talked to the audience, everyone in Na Ngoo, about the services the

Part two of a series, this report describes microscopic findings in bones from persons exposed to 1.0 to 4.0 ppm fluoride in comparison with a series of controls. The study discloses no pathological condition that could be attributed to fluoride ingestion.

Pathological studies in man

after prolonged ingestion of fluoride in drinking water

E. F. GEEVER, M.D., N. C. LEONE, M.D.,
P. GEISER, M.S., and J. E. LIEBERMAN, M.A.

PUBLIC HEALTH programs to prevent dental caries by artificial fluoridation of drinking water have always considered the possibility of cumulative toxic effects. The present studies were instituted to determine whether pathological changes could be correlated with prolonged ingestion of fluoride-bearing water.

In an earlier publication we reported the necropsy findings in persons who had lived in a community with a fluoride level of 2.5 ppm (1). This is $2\frac{1}{2}$ times the level recommended for prevention of dental caries. Since necropsies do not routinely include microscopic examination of bones, a separate study of this phase of the question was undertaken. Persons com-

ing to necropsy who had lived in communities with 1.0 to 4.0 ppm fluoride, naturally occurring or added, in the drinking water were the subjects.

Material and Method

Necropsies were performed in Grand Rapids, Mich. (1 ppm), Colorado Springs, Colo. (2.5 ppm), Amarillo, Tex. (2.8 ppm), and Lubbock, Tex. (4.0 ppm). Bone specimens were obtained through the cooperation of local pathologists: Dr. Joseph Mann and Dr. Harold Bowman of Grand Rapids, Dr. Morgan Berthrong and Dr. Raoul Ulrich of Colorado Springs, Dr. Marie Shaw of Lubbock, and Dr. John Denko and Dr. C. P. Churchill of Amarillo. The series consisted of 37 persons who had resided for 10 years or more in the above communities. The majority, 24, were residents of Colorado Springs; they provided 65 bones for the study. The ages of the subjects, 17 men and 20 women, ranged from 36 through 90 years.

Dr. Geever is pathology consultant, Dr. Leone is chief of medical investigations, and Miss Geiser is a nurse officer, National Institute of Dental Research, Public Health Service, Bethesda, Md. Mr. Lieberman is a mathematical statistician, Biometrics Branch, Division of Research Services, National Institutes of Health.

Medical Care Responsibilities

Joint letter by the Surgeon General and Commissioner of Social Security to State and Territorial Health Officers and State Directors of Public Welfare, June 26, 1958

The fields of health and welfare administration offer many opportunities for joint action which can be mutually beneficial to the responsible agencies and result in improved services to the public. These opportunities have existed for years and in some States and communities have received considerable attention. Recent developments, however, have greatly expanded the opportunities for a concerted attack on the prevention and reduction of economic dependency due to illness. These developments accentuate the need for the closest possible working relationships between health and welfare agencies at all levels of government. Anything short of this aim is costly, both in terms of taxpayers' dollars and human well-being.

This joint letter is intended to focus on the growing need and to encourage mutual consideration of program objectives, plans, and resources by State health and welfare officials.

That illness is a major contributing factor to economic dependency and that low income breeds health problems are well-known facts. Public health departments have a traditional responsibility to provide and promote communitywide health services, such as immunization, public health nursing, and casefinding programs, nutrition and health education services. Many health departments have traditional responsibilities in regard to the medically indigent which sometimes involve diagnostic and treatment services. Special arrangements to ensure the fullest possible coverage of public welfare clients in all types of health

programs should result in improved health and decreased dependency for this population group.

Provision of or payment for medical care services for public welfare clients is commonly a responsibility of public welfare agencies. Public health agencies have much to contribute to the successful operation of such services. This assistance can take the form of ensuring that welfare clients receive the direct services of the public health agency, such as services for crippled children or for tuberculosis control. In other instances, the assistance may be through professional consultation in the establishment of standards and procedures for making medical care available to the welfare client. In some States it might be desirable for the welfare department to contract with the health department to administer the medical care aspects of the public welfare program.

Obviously, the arrangements will depend upon the varying legal and operational potentialities in the States. Again, however, joint consideration of the problems is imperative to effective and efficient working relationships. This is particularly important when public welfare agencies are contemplating new or additional medical care responsibilities.

We all know that family finances and the ability and willingness of a family to seek to correct health defects are closely related. With increased emphasis on chronic disease programs and health services for older persons, the problems of economic security are becoming ever more apparent as major considerations affecting the success of public health programs.

Public welfare agencies, with their

wide experience in administering financial assistance and welfare services related to the particular needs of the individual, can be of real help to health departments in problems of this kind. The welfare department can identify health needs of recipients and assist them to fully utilize public health facilities. Similarly, provision of social services and financial assistance to persons whose need is recognized by medical social workers and other staff of the health department frequently depends upon the resources and staff of the welfare department. Such interagency relationships cannot be maintained effectively unless each agency is fully informed on the programs and resources of the other.

These examples of mutual interest areas between health and welfare agencies could be multiplied many times. The most useful identification of such areas, however, is in relation to the program objectives and resources of an individual State and as a first step in the development of interagency planning.

We are confident that increased attention to opportunities for interagency cooperation will result in better health and welfare services to the public and will enable both agencies to carry out more effectively their respective legal responsibilities.

The full resources of the Public Health Service and the Social Security Administration are prepared to provide technical assistance and consultation at your request to assist in accomplishing these goals.

L. E. BURNET
Surgeon General

C. I. SCHOTTLAND
Commissioner of Social Security



Figure 2. Active osteoclasia and fibrosis, periosteum and cortex of lumbar vertebra, 105X, 59-year-old man, control series.

new bone pushed up the periosteum in a trabecular pattern. Sometimes foci of bone were found in the parosteal tissue with no apparent connection to the subjacent bony cortex.

Irregularity in contour in some fields was due to old or active periosteal osteoclasia (figs. 1 and 2). Sometimes gaps were visible in the bone where blood vessels entered and the periosteum appeared to be the only barrier between the marrow and adjacent marginal tissue, particularly in the sections of vertebrae. The majority of the frayed or fuzzy papillary projections of bone and basophilic material appeared to be old and unaccompanied by cellular proliferation. However, small strips or foci of bright, eosinophilic, new and incompletely calcified bone (osteoid) could be observed also. Often cuboidal or columnar osteoblasts were seen nearby.

Surface irregularity was frequently found near the sites of tendon insertion in the sections of iliac crest in both groups. Often it was accompanied by cartilaginous changes and irregular basophilic staining presumably due to calcification (fig. 3). Irregularity due to extension of cartilaginous and basophilic stained material along the front periosteal surface away from the intervertebral joint and toward

the midlevel of the vertebral body was often seen.

The criteria used in grading excessive bone or calcium deposition were based on the maximum degree of projection from adjacent surfaces as measured by an ocular micrometer, the maximum foci per standard low-power microscopic field, the number of fields affected, and the presence of extraperiosteal bone or basophilic stained foci independent of the adjacent cortex. Bones from the fluoride and control groups were examined alternately.

Irregularity in periosteal contour due to excessive bone or calcium deposition, or both, was found in 48 of a total of 94 satisfactory bone sections in 25 of the 33 controls (table 1). Similar changes were present in 35 of a total of 99 satisfactory bone sections in 24 of 37 fluoride-exposed persons. Focal, nonspecific inflammation was found in 3 bones in 3 controls and in 2 bones in 2 of the fluoride group.

Active osteoclasia was found not infrequently with 1 or 2 osteoclasts recognizable in the margins of typical Howship's lacunae. Arbitrary criteria were set up to evaluate increased activity. Since the tissue sections were only approximately equal in size, quantitation could also be only approximate. Grading was started at +, for a mild, or slight, increase based on

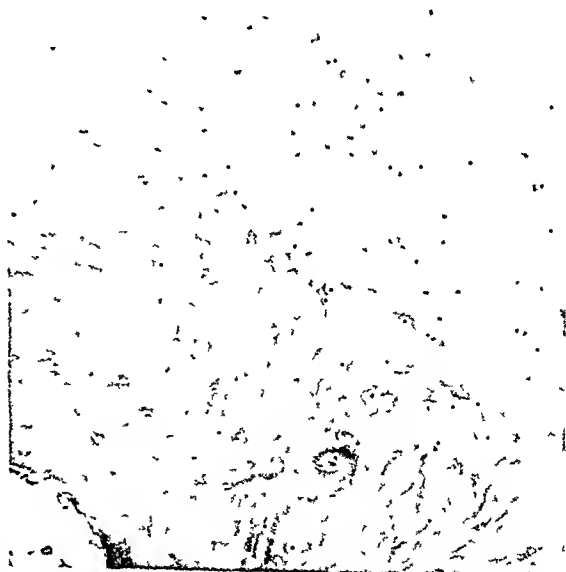


Figure 3. Parosteal and periosteal cartilaginous changes, iliac crest, 35X, 73-year-old woman, control series.

For comparison with the fluoride series, 33 persons, 24 men and 9 women, who had resided in essentially nonfluoride (less than 0.5 ppm) communities served as controls. They ranged in age from 21 through 87 years.

Most of the persons in both series died suddenly. The most common causes of death were trauma, coronary heart disease, and cerebral vascular accidents. Those with chronic illness and diseases known to affect bone structure were excluded. Thus, there were none with primary or metastatic bone cancer, long-standing cancer of other organs, or renal or parathyroid disease.

In most cases three bones were selected for the microscopic studies: the body of a lumbar vertebra, a portion of iliac crest, and the sixth rib. In addition, the lumbar intervertebral body joints were examined for possible changes in articular cartilage. Less often, the sternum was also studied. A few bone or joint specimens proved unsatisfactory for some phase of the study, with the result that the totals vary.

The bones were fixed in 10 percent formalin and forwarded to the National Institute of Dental Research. Decalcification was carried out using a 5-percent-formic-acid method. Paraffin embedding and sectioning were performed and hematoxylin and eosin stains were applied, according to routine procedures.

Fluoride analyses of most of the specimens in both these series (plus a few other specimens) were performed independently. The results are reported in a separate article, by Zipkin and colleagues, on pages 732-740 of this issue.

Parosteal and Marginal Tissue

Parosteal and marginal tissue consisted of laminated or loose collagenous elements often merging with and indistinguishable from periosteum. Striated muscle fibers, fat, blood vessels, lymph nodules, nerve trunks, or nerve ganglia were sometimes observed. In the sections of vertebra, the longitudinal ligaments were often included.

Focal, nonspecific, chronic inflammatory reactions were found in the marginal tissues of 4 bones from 3 persons in the control group. These foci were found adjacent to a lumbar

vertebra in 3 bones and near the sternum in 1. Focal swelling and necrosis of striated muscle fibers were found in another control, a 59-year-old woman who died of rheumatic heart disease. The changes, found near lumbar vertebrae were not accompanied by inflammatory reaction.

In the fluoride-exposed group, inflammatory change was observed in tissues of only one person. It consisted of a fairly severe subacute nonspecific parostitis of the rib. In both the fluoride and the control groups small marrow foci were seen occasionally in periosteal and parosteal tissue of the vertebrae. These foci were undoubtedly related to the marrow of the vertebral body.

Periosteum

The periosteal surface was often irregular, microscopically, in both series. The irregularity in itself followed no consistent pattern. Sometimes slender, frayed or fuzzy papillary projections of bone and basophilic material, presumably calcium, were seen. Occasionally, smooth deposits of bone bulged up over wider areas under the periosteum. In other instances,



Figure 1. Active osteoclasia and fibrosis, periosteum of iliac crest, 105X, 44-year-old man, resident 40 years of a community with a natural fluoride level of 2.5 ppm.



Figure 2. Active osteoclasia and fibrosis, periosteum and cortex of lumbar vertebra, 105X, 59-year-old man, control series.

new bone pushed up the periosteum in a trabecular pattern. Sometimes foci of bone were found in the parosteal tissue with no apparent connection to the subjacent bony cortex.

Irregularity in contour in some fields was due to old or active periosteal osteoclasia (figs. 1 and 2). Sometimes gaps were visible in the bone where blood vessels entered and the periosteum appeared to be the only barrier between the marrow and adjacent marginal tissue, particularly in the sections of vertebrae. The majority of the frayed or fuzzy papillary projections of bone and basophilic material appeared to be old and unaccompanied by cellular proliferation. However, small strips or foci of bright, eosinophilic, new and incompletely calcified bone (osteoid) could be observed also. Often cuboidal or columnar osteoblasts were seen nearby.

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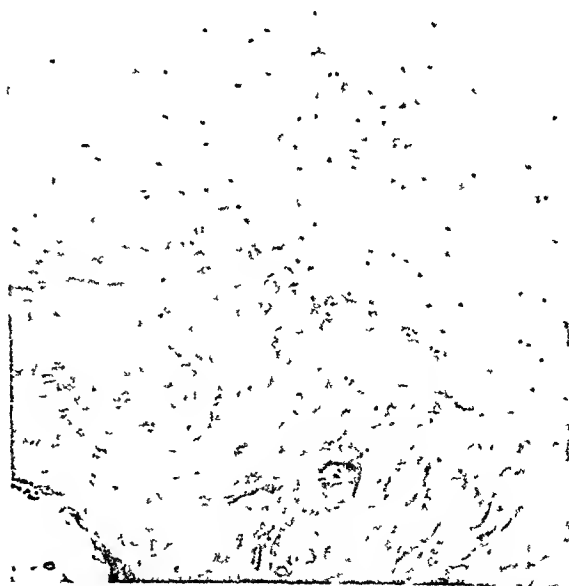


Figure 3. Parosteal and periosteal cartilaginous changes, iliac crest, 35X, 73-year-old woman, control series.

Table 1. Periosteal changes in persons ingesting fluoride and in controls

| Periosteal changes | Fluoride series | | Control series | |
|---|-----------------|----------------|----------------|----------------|
| | Number bones | Number persons | Number bones | Number persons |
| Total examined.... | 99 | 37 | 94 | 33 |
| Irregular periosteal bony proliferation and/or calcification..... | 35 | 24 | 48 | 25 |
| Focal periostitis..... | 2 | 2 | 3 | 3 |
| Excessive active osteoclasia..... | 4 | 4 | 3 | 3 |

2 to 4 multinucleated osteoclasts per low-power field associated with Howship's lacunae and present in more than one field. Grade ++, or moderate, was based on at least 5 osteoclasts, and grade + + +, or severe, on 7 or more osteoclasts per low-power field. On the basis of this scale, ++ osteoclasia was observed in 2 bones and + in another for a total of 3 bones with such periosteal changes in 3 controls (table 1). In the fluoride group 2 bones showed a + increase, 1 a ++, and 1 a +++ increase in activity for a total of 4 bones in 4 individuals.

Compact Cortical Bone

Recently deposited bone (osteoid) could be determined by eosinophilic staining of the matrix, as mentioned above. This was particularly impressive when layers of various ages were arranged side by side. Configuration of cement lines, degree of cellularity, and appearance and arrangement of osteoblasts and osteocytes also aided. In the compact portion, swelling of endosteal cells was sometimes observed on surfaces abutting the marrow cavity, within the Haversian canals or within large open endosteal spaces. Sometimes such cellular arrangement was also associated with strips of bright eosinophilic new bone (osteoid). Other fields showed new bone layers without evident cellular activity. Serial section in such instances might have disclosed the presence of osteoblasts nearby. Some zones revealed what appeared to be mobilization and swelling of

endosteal cells without evidence of new bone formation. This might have represented a preliminary phase in such a process.

The cortices of the rib and iliac crest were thicker than those of the vertebra, and the Haversian systems there were usually well defined. Sometimes, however, excessive decalcification made the lamellae appear delicate, poorly stained, and incompletely outlined.

An attempt was made to evaluate osteogenesis and osteoporosis objectively after the first survey of the material indicated that the differences in the amount of bone substance between the fluoride series and the controls would be slight, if there were any at all. No satisfactory method for such an evaluation could be

Table 2. Average coded measurements¹ for compact cortical bone, fluoride and control series

| Bone category | Fluoride series | Control series | Both series |
|--|-----------------|----------------|--------------|
| All bones.. | 1. 550 (99) | 1. 734 (95) | 1. 640 (194) |
| Lumbar vertebra along articular cartilage..... | 1. 316 (34) | 1. 418 (31) | 1. 357 (65) |
| Lumbar vertebra cortex elsewhere..... | 1. 510 (36) | 1. 608 (31) | 1. 556 (67) |
| Rib cortex..... | 1. 893 (29) | 2. 148 (33) | 2. 029 (62) |

¹ Square root of measurements.

NOTE: Figures in parentheses are numbers of measurements.

Table 3. Analysis of variance, compact cortical bone measurements

| Source | d.f. | Sum of squares | Mean square | F | F .05 |
|-------------------------|------|----------------|-------------|--------|-------|
| Mean..... | 1 | 521. 95 | | | |
| Total..... | 193 | 45. 85 | | | |
| Bone part..... | 2 | 14. 59 | 7. 29 | 23. 52 | 3. 17 |
| Control vs. fluoride.. | 1 | 1. 16 | 1. 16 | 3. 74 | 4. 01 |
| Sex..... | 1 | . 01 | | | |
| Interactions: | | | | | |
| Bone part×fluoride..... | 2 | . 23 | | | |
| Bone part×sex..... | 2 | . 77 | | | |
| Sex×fluoride..... | 1 | . 02 | | | |
| Within groups..... | 57 | 17. 44 | . 31 | | |
| Remainder..... | 127 | 11. 64 | | | |

¹ Adjusted for unequal numbers.

² Significant at $P < .01$.

found in the literature, and the following approach was therefore devised:

To obtain an overall impression of representative thickness, the compact layer was measured with an ocular micrometer, and the two extremes, for the thickest and the thinnest points were recorded. All measurements were made with the same microscope, 10X ocular, and the lowest power or scanning objective, 5X N.A. 1.4. A rough calibration would be 1 oculomicrometer unit equals 0.1 mm. The iliac crest could not be measured satisfactorily because of marked irregularity of cortical contour. Hence only the measurements for the vertebra and the rib were used. Measurements of the cortex of the vertebral body adjacent to the hyaline articular cartilage were tabulated separately from those of the cortex of the vertebral body at other points, usually anterior and lateral. Osteoarthritic zones with spur or bridge formation were avoided as far as possible.

Statistical analysis of the measurements revealed no significant differences between the controls and the fluoride series (tables 2 and 3). The average coded measurements (square root of measurements) were 1.734 units for the controls and 1.550 for the fluoride series. The F value attributable to the difference was 3.74,



Figure 4. Increased deposition of osteoid tissue, rib trabeculae, 105X, 71-year-old man, resident 48 years of a community with a natural fluoride level of 4.0 ppm.

and the theoretical F value with 1 and 57 degrees of freedom was 4.01 at the 5 percent probability level of significance.

The mean measurements for the various bone categories (the lumbar vertebral cortex adjacent to the hyaline articular cartilage, the vertebral cortex elsewhere, and the rib cortex) did, however, differ significantly (tables 2 and 3). The F value attributable to differences in the measurements was 23.52, which is to be compared with the theoretical F value of 3.17. This comparison was independent of the fluoride-control comparison, and an adjustment was made for unequal numbers of bones in the three categories.

Abnormalities in bone architecture, such as irregular or excessive new bone deposition, resorption, excessive cellularity, fibrosis, and increased active osteoclasia were evaluated also. All bones were studied for these conditions.

Focal abnormality in cortical bone architecture was found in 2 bones in 1 control (table 4). Similar focal abnormality was observed in 4 bones in 2 of the fluoride group. An example of one type of abnormality observed, focal increased osteoid deposition, is shown in figure 4.

Table 4. Cortical and medullary bone changes in persons ingesting fluoride and in controls

| Bone changes | Fluoride series | | Control series | |
|------------------------------|-----------------|----------------|----------------|----------------|
| | Number bones | Number persons | Number bones | Number persons |
| Total examined | 99 | 37 | 94 | 33 |
| <i>Compact cortical bone</i> | | | | |
| Architectural abnormalities | 4 | 2 | 2 | 1 |
| Excessive active osteoclasia | 20 | 15 | 15 | 10 |
| <i>Spongy medullary bone</i> | | | | |
| Architectural abnormalities | 8 | 5 | 7 | 5 |
| Excessive active osteoclasia | 18 | 11 | 11 | 7 |

Active osteoclasia was believed increased slightly (+) in 10 bones, moderately (++) in 3 bones, and severely (+++) in 2 bones from 10 persons in the control series of 94 bones (fig. 5). In the fluoride group of 99 bones, osteoclasia was considered increased slightly (+) in 15 bones, moderately (++) in 4 bones, and severely (+++) in 1 bone from a total of 15 individuals.

Spongy Bone of Medulla

An attempt was made, though admittedly the results are approximations only, to determine trabecular breadth or thickness by ocular micrometer measurement, as was done with the cortex. The two extremes were recorded, and a representative value was tabulated. Abnormalities in bone architecture and evidence of increased osteoclasia were recorded also.

The average coded measurements for the spongy medullary bone are given in table 5. The differences in values between the controls and the fluoride series were not significant when the figures were analyzed statistically. However, as in the cortical bone analysis, a statistical difference was found between the values for the three bone categories.

Among the controls qualitative abnormali-

Table 5. Average coded measurements¹ for spongy medullary bone, fluoride and control series

| Bone category | Fluoride series | Control series | Both series |
|----------------------|-----------------|----------------|--------------|
| All parts..... | 1. 134 (97) | 1. 126 (90) | 1. 130 (187) |
| Lumbar vertebra..... | 1. 183 (36) | 1. 185 (31) | 1. 184 (67) |
| Iliac crest..... | 1. 215 (32) | 1. 264 (26) | 1. 237 (58) |
| Rib..... | . 984 (29) | . 961 (33) | . 976 (62) |

¹ Square root of measurements.

NOTE: Figures in parentheses are numbers of measurements.

ties were found in 7 bones in 5 persons (table 4). Focal architectural irregularity was seen in 6 bones, and a small osteoma, in the seventh (fig. 6). Similar focal irregularity in architecture was observed in 8 fluoride-exposed bones in 5 individuals. No tumors were found among the fluoride group.

Active osteoclasia was believed increased slightly (+) in 11 bones from 7 persons in the control series. In the fluoride group osteoclasia was considered increased slightly (+) in 14 bones, moderately (++) in 3, and severely (+++) in 1 bone from a total of 11 persons (fig. 7). In both groups active osteoclasia was often associated with osteoblastic activity and new bone deposition nearby. Variation in staining characteristics of the intercellular substance, configuration of the cement lines, degree of cellularity, and appearance and arrangement of osteocytes and osteoblasts, as mentioned in the discussion of the cortex, combined to provide fairly reliable impressions concerning relative ages of different bone layers.

Bone Marrow

Most marrow sections of both the fluoride and the control series showed active hematopoiesis. Of 93 satisfactory marrow sections in the control group, 63 were graded +++; 25, ++; 4, +; and 1 was considered atrophic. Interesting qualitative features of the marrow sections from the controls included focal lymphoid hyperplasia (11 sections), focal erythroid hyperplasia (9 sections), and focal myeloid hyperplasia (7 sections). In 3 there was focal



Figure 5. Increased active osteoclasia, vertebral cortex, 105X, 74-year-old man, control series.

proliferation of megakaryocytes. The marrow of one bone revealed rather extensive fibrosis, and that of another showed focal hyperplasia of eosinophils. There were thus 32 bones with focal qualitative marrow changes.

Of 97 satisfactory marrow sections in the fluoride-exposed group, 69 were graded +++ quantitatively; 23, ++; and 5, +. Comparative qualitative study showed 17 with focal lymphoid hyperplasia, 1 with focal erythroid hyperplasia, and 4 with focal myeloid hyperplasia for a total of 22 qualitative changes.

Intervertebral Lumbar Body Joint

Osteophytosis occurred in both groups in the form of "spurs" or "lips," sometimes bridges (figs. 8 and 9). The osteophytes were composed of irregularly arranged osteoid tissue and mature bone, irregularly calcified cartilage, and fibrous tissue often associated with increased osteoclastic activity (fig. 10). The marrow in the osteophytes was usually fatty and deficient in hematopoietic elements. Accompanying the above process were mixtures of bone, fibrous tissue, and haphazardly calcified cartilage at and near the attachment of the osteophyte to the line of junction between hyaline articular cartilage and cortical bony plate. The normally



Figure 7. Increased active osteoclasia, trabecula of lumbar vertebra, 415X, 69-year-old woman, resident 28 years of a community with a natural fluoride level of 2.5 ppm.

even contour along this line was usually disrupted. Varying degrees of thickening were noted in the subchondral bone along the line of attachment to the osteophyte. Large osteophytes were often associated with irregularity in appearance of that portion of the annulus fibrosus near the attachment of the osteophyte. Fibrillation, irregularly increased porosity, or cystic degeneration was observed. Clefts in the intervertebral joint matrix were seen in both groups and were impossible to differentiate from artefacts.

The periosteum and anterior longitudinal ligaments over the osteophytic process revealed only nonspecific fibrous thickening.

No inflammatory reaction was noted within the annulus fibrosus or the nucleus pulposus even with advanced osteophytosis. The central portion of the nucleus pulposus was usually porous in the younger subjects (30-39 years) of both groups. In such cases multiple, irregularly shaped, cystic zones were apparent. They contained amorphous eosinophilic material in which occasional viable-appearing cartilage cells could be identified.

The annulus fibrosus in the young patients in



Figure 6. Small osteoma, rib medulla, 105X, 35-year-old man, control series.

both groups consisted of fairly dense layers of sparsely cellular fibrous tissue. As this tissue approximated the nucleus pulposus, it was arranged in interlacing bands among cartilage cells.



Figure 8. Osteophyte, lumbar vertebral body, 14X, 62-year-old woman, resident 19 years of a community with a natural fluoride level of 2.5 ppm.

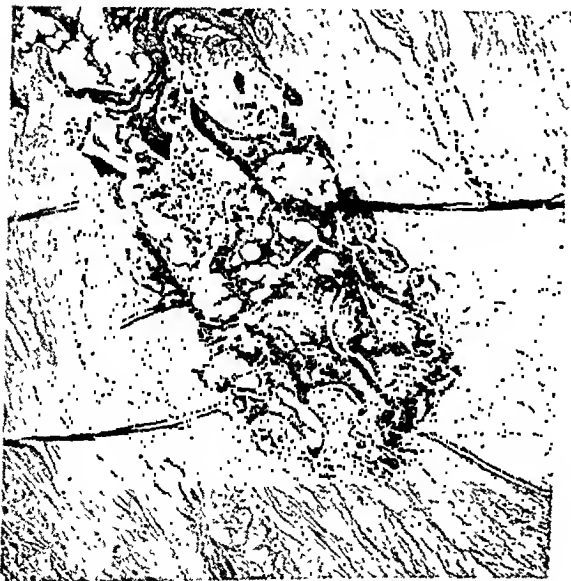


Figure 9. Fibrosis and increased osteoclasia in an osteophyte, lumbar vertebral body, 35X, 73-year-old woman, control series.



Figure 10. Increased active osteoclasia and fibrosis near osteophyte attachment, 105X, same bone and patient as in figure 9.

Also in the young patients the hyaline articular cartilage blended almost imperceptibly with the loose fibrocartilage or elastic cartilage of the nucleus pulposus and annulus fibrosus. Some variation in thickness was noted in the hyaline articular cartilage. The cartilage cells were arranged more regularly and their nuclei were oriented more nearly in parallel planes than those in the nucleus pulposus or annulus fibrosus. Occasionally, small clefts with loose connective tissue and capillaries penetrated the hyaline cartilage near its line of junction with the subchondral bone. The line of calcification was fairly even along this junction in the young patients, but prongs of cartilage extended beyond into the subchondral bone, and, similarly, microscopic prongs or tongues of bone and osteoid tissue projected upward into the hyaline articular cartilage. The marrow adjacent to the subchondral bone occasionally showed focal proliferation of delicate fibroblastic elements in the young patients of both groups.

In the aged patients of both groups cystic changes in the nucleus pulposus and fibrillar changes in the annulus fibrosus were more prominent. In the annulus near the periosteal junction, fibrosis and proliferation of vascular

Table 6. Changes in lumbar intervertebral body joints

| Joint changes | Fluoride series | Control series |
|---------------------------------------|-----------------|----------------|
| Total examined----- | 31 | 35 |
| Osteophytosis----- | 12 | 18 |
| Other evidence of osteoarthritis----- | 4 | 5 |
| Miscellaneous pathology----- | 1 | 1 |

channels were sometimes observed. The vascular channels were occasionally arranged in clusters resembling telangiectasia.

Of 31 satisfactory sections of lumbar intervertebral joints from the controls, there were 12 with osteophytosis (table 6). The severity was rated arbitrarily from + to +++. In 6 persons it was graded +++, or severe. In the fluoride group of 35 satisfactory sections, there were 18 with osteophytosis. It was rated severe (+++) in 9. Other evidence of osteoarthritis included irregular proliferation of bone, osteoid tissue, cartilage, and fibrous elements disrupting the even line of junction of hyaline articular cartilage and subchondral bone. This irregularity was apart from that near the attachment of osteophytes described above. Such evidence of osteoarthritis was found in 4 controls and 5 of the fluoride group. Miscellaneous arthritic changes suggestive of trauma and accompanied by distortion of the joint were observed in one person in each series. There was no example in either series of rheumatoid spondylitis.

Discussion

Reports of microscopic bone changes in man after chronic exposure to fluorides are rare. Furthermore, some of the cases reported have been complicated by chronic disease that could have contributed to the changes. Roholm (2) reported 2 cases, 1 of which was complicated by a syphilitic infection. The other case occurred in a 68-year-old man exposed to cryolite for 25 years. The findings on gross and microscopic study included calcification of marginal tissues, ligaments, and tendons, increased thickening of the compact bone, irregular gran-

ular deposition of calcium in the intercellular substance, osteoid reaction around Haversian systems, and deposition of calcified fibrous tissue. The fluoride level of the bones was as high as 60 times normal values.

Another case, reported by Linsman and McMurray (3) and later listed in the Atlas of Orthopedic Pathology (4), was complicated by chronic renal disease. This occurred in a 22-year-old white man from a high-fluoride area in Texas. On microscopic examination his bones were described as having large trabeculae and "granular" architecture with lamellae which were irregular, not well seen, and with a tendency to fragmentation. Also described was some "condensation" of bone at the periphery of the trabeculae. The sternum contained 0.69 percent fluoride and the lumbar vertebra 0.75 percent.

In 1937 Bauer, Bishop, and Wolff (5) presented the findings in a worker exposed to phosphate rock containing about 4 percent fluoride. At necropsy the chemical concentration of the bones was 10 to 20 times normal fluoride values. The microscopic changes, reported only in a rib, included an increase in width of the cortex and thickening of the trabeculae. These investigators found no young osteoid tissue and no widespread deposits of calcium as described by Roholm. They observed little distortion of the normal bone architecture except reduction in the diameter of the Haversian canals and encroachment upon the marrow.

Weinmann and Sicher (6) advanced a tentative theory of the effects of fluorides in older persons and animals: first, there is a slow and incomplete destruction of compact bone and partial transformation into spongy bone; then, fairly dense osteophytes of both immature and mature bone and narrow osteoid seams are laid down as compensatory reinforcement, most prominent near the periosteum.

In our study microscopic changes in ligaments, parosteal tissue, and the periosteum were more numerous in the controls than in the fluoride series. Nothing comparable to Roholm's findings of calcification of marginal tissues, ligaments, and tendon was observed. Focal calcification and cartilaginous changes of the periosteum and adjacent tendon or fascia of the iliac crest were seen with equal frequency

and intensity in both the control and the fluoride groups and were interpreted as normal.

Statistical analysis of measurements of bone mass in the cortex and medulla revealed no significant difference between the controls and the fluoride series. Since the fluoride group was approximately 12 years older than the control group (table 7), the differences in occurrence of osteoclasia and osteophytosis were studied further to determine whether there was any relation to age.

Table 7. Average age (in years) of persons supplying bone and joint specimens for microscopic examination

| Sex | Fluoride series | Control series | Both series |
|------------|-----------------|----------------|-------------|
| Both sexes | 67.8 (37) | 55.6 (33) | 62.0 (70) |
| Male | 64.5 (17) | 54.0 (24) | 57.3 (41) |
| Female | 70.5 (20) | 60.0 (9) | 67.2 (29) |

NOTE: Figures in parentheses are numbers of persons.

Ten of the 15 bones with increased active osteoclasia in the cortex of the controls were from 6 persons 60 years of age or over. There were 41 bones from 14 subjects in this age category; thus the incidence of increased osteoclasia, by bones, was 24.4 percent. By contrast 16 of the 20 bones with increased cortical osteoclasia in the fluoride series were from 16 persons 60 years of age or over. There were 68 bones from a total of 26 subjects in this age category for an incidence, by bones, of 23.5 percent.

Increased active osteoclasia in the medulla was similarly considered. Eight of the 11 bones of the controls with that finding were from 5 persons 60 years of age or over. Thus, the incidence for the 41 bones from this age category was 19.5 percent. In the fluoride series 17 of the 18 bones with that finding were from 10 persons aged 60 or over. The 68 bones from that age group yielded an incidence of 25.0 percent.

Examination of lumbar intervertebral body joints showed an increase in osteophytosis in the fluoride series. Many roentgenologists and orthopedists feel that osteophytosis in the lum-

bar vertebrae is not in itself to be considered a manifestation of arthritis or a cause for symptoms or disability (7, 8). Schmörl (9) found spinal osteophytes in 90 percent of all women over 60 years of age. On analyzing our data in the light of the difference in average age between the two groups, the difference in incidence of osteophytosis almost disappears. Nine of 13 patients, 69.2 percent, 60 years of age or over among the controls had osteophytosis as compared with 16 of 24, 66.0 percent, in the same age category in the fluoride series.

The differences in incidence of architectural abnormalities were not significant. Bone marrow examinations showed focal qualitative changes of minor importance. They were more frequent in the controls than in the fluoride series.

The results of this study can be correlated to some extent with previous work on necropsy material in Colorado Springs, where the fluoride level is 2.5 ppm (1). In that study there was no significant difference in the occurrence of bone cancer between 334 long-term residents (more than 20 years) and 188 short-term residents (less than 5 years). There were 3 deaths attributed to bone cancer in the former group and 2 in the latter. The microscopic study of bones adds further support to the belief that fluoride in drinking water at a level of 1.0 ppm can be ingested without cumulative toxic effect.

Summary

Microscopic examinations were made of 99 bones from 37 persons coming to necropsy who had resided 10 years or more in communities where the drinking water contained 1 to 4 ppm of naturally occurring or artificially added fluoride. Ninety-four bone specimens from 33 controls who had lived in areas where the drinking water contained less than 0.5 ppm fluoride were used for comparison.

In addition to the bone specimens, the lumbar intervertebral body joints of the subjects were examined.

The microscopic examinations showed no significant differences between the fluoride-exposed group and the control group that could be related to fluoride intake. Microscopic changes

in the bones and joints incidental to aging and due to non-fluoride-related conditions were observed in both series.

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Radiation Protection

The New Jersey Legislature has created a Commission on Radiation Protection in the State department of health. The recently approved Radiation Protection Act specifically details the duties and responsibilities of the health department and the newly created commission.

The commission, consisting of five scientifically trained members appointed by the Governor and serving 4-year terms without compensation, will adopt, promulgate, amend, and repeal codes, rules, and regulations that may be necessary to prohibit or prevent unnecessary radiation.

Policies and programs developed by the health department under authority of this act will be reviewed by the commission. The commission, when requested, will also provide the department with technical advice and assistance.

The health department's responsibilities with regard to radiation protection will encompass administration, personnel, program development and evaluation, consultation with interested or affected groups, research, training, and demonstrations, health education and

information, review of plans and specifications for the design and shielding of radiation sources, and inspection.

The act requires "all sources of radiation shall be shielded, transported, handled, used, and kept in such manner as to prevent all users thereof and all persons within effective range thereof from being exposed to unnecessary radiation." The health department is empowered to issue orders directing persons to cease and abate causing, allowing, or permitting "unnecessary radiation." In the event of an emergency, the health department has the right to order immediate compliance with codes, rules, and regulations laid down by the commission, and it may bring civil action in the Superior Court to prevent violations of the provisions.

No ordinance, resolution, or regulation concerning unnecessary radiation adopted by any municipality, county, or local board of health can be effective, according to the act, until a certified copy of such ordinance or regulation has been submitted to the commission and approved by the commissioner of the health department.

Analysis of the rib, iliac crest, vertebra, and sternum for fluoride indicates a direct increase in bone fluoride with an increase in fluoride in drinking water up to 4.0 ppm.

Fluoride deposition in human bones

after prolonged ingestion of fluoride in drinking water

I. ZIPKIN, Ph.D., F. J. McCLURE, Ph.D., N. C. LEONE, M.D., and W. A. LEE, B.S.

IN CONJUNCTION with microscopic examination of human bones for possible effects of prolonged ingestion of fluoride in drinking water (reported in this issue by Geever and associates, pp. 721-731), essentially the same bones were analyzed for ash and fluoride. These bones were obtained at autopsy from 69 persons, 36 of whom were exposed to 1.0 to 4.0 ppm fluoride for 10 to 76 years. The remaining 33 had lived in areas with less than 1.0 ppm fluoride for 10 to 87 years.

This study represents the first systematic survey of the fluoride concentration of bones of individuals exposed to various concentrations of fluoride in drinking water. Previous studies of exposure to high levels of fluoride, recently reviewed by McClure and associates (pp. 741-746 of this issue), have dealt with no more than

four cases (1-5). More extensive data have been reported on the fluoride concentration of selected bones of individuals in low-fluoride areas (6-8).

Most of the persons whose bones were examined in the present studies died suddenly, the chief causes being trauma, coronary heart disease, and cerebrovascular accidents. Although bones of persons with chronic illness or diseases known to affect bone structure were excluded from the microscopic study, they were included in the fluoride deposition study so that the effect of such conditions might be observed. The fluoride analysis thus included bones from 3 individuals with a malignancy and 3 with renal disease.

The 69 individuals in the fluoride deposition study, 40 men and 29 women aged 26 through 90 years, provided 190 bones and 64 specimens of intervertebral cartilage. Approximately 80 percent of these bones and cartilage specimens were also examined histologically. The bones, consisting of a portion of the iliac crest, the lumbar vertebra, and the sixth rib, were fixed in 10 percent formalin at autopsy.

Dr. Zipkin and Dr. McClure, biochemists, are respectively assistant chief and chief of the Laboratory of Biochemistry, National Institute of Dental Research, Public Health Service. Dr. Leone is chief of medical investigations with the institute, and Mr. Lee is a chemist with the biochemistry laboratory.

Table 1. Percentage ash and fluoride in dry, fat-free bones of individuals ingesting drinking water containing less than 1 ppm fluoride

| Subject No. | Sex | Age (years) | Residence (years) | Iliac crest | | Rib | | Vertebra | |
|-------------------------------|--------|-------------|-------------------|-------------|----------|------|----------|----------|----------|
| | | | | Ash | Fluoride | Ash | Fluoride | Ash | Fluoride |
| 0.1 ppm fluoride | | | | | | | | | |
| 1 | Male | 27 | 27 | 56.8 | 0.019 | 61.4 | 0.020 | 50.2 | 0.031 |
| 2 | Male | 32 | 12 | 56.2 | .044 | 56.9 | .037 | 50.4 | .054 |
| 3 | Male | 35 | 35 | 58.1 | .045 | 59.4 | .043 | 43.7 | .043 |
| 4 | Female | 38 | 12 | | | | | 52.2 | .024 |
| 5 | Male | 47 | 10 | | | | | 49.9 | .056 |
| 6 | Female | 47 | 15 | 57.6 | .020 | 57.9 | .024 | 46.6 | .019 |
| 7 | Male | 50 | 25 | 59.6 | .030 | 60.9 | .024 | 51.7 | .026 |
| 8 | Female | 55 | 20 | 58.9 | .038 | 53.9 | .043 | 43.8 | .036 |
| 9 | Male | 56 | 20 | 52.6 | .046 | 57.8 | .047 | 47.9 | .057 |
| 10 | Male | 62 | 62 | 54.9 | .032 | 57.6 | .028 | 50.9 | .038 |
| 11 | Male | 62 | 62 | 58.8 | .024 | 57.3 | .031 | 46.8 | .028 |
| 12 | Male | 65 | 41 | 54.2 | .034 | 54.0 | .062 | 43.2 | .034 |
| 13 | Male | 66 | 15 | 57.6 | .028 | 61.9 | .039 | 45.7 | .026 |
| 14 | Female | 68 | 10 | 62.9 | .073 | 65.5 | .077 | 55.7 | .079 |
| 15 | Male | 69 | 10 | 58.3 | .035 | 60.0 | .037 | 50.5 | .034 |
| 16 | Male | 70 | 60 | 54.8 | .032 | 60.2 | .039 | 44.3 | .042 |
| 17 | Female | 73 | 32 | 54.0 | .048 | 57.6 | .060 | 44.6 | .055 |
| 18 | Female | 82 | 40 | 56.8 | .044 | 58.8 | .037 | | |
| 19 | Male | 87 | 87 | 59.2 | .055 | 59.8 | .062 | 46.9 | .050 |
| 0.2 ppm fluoride | | | | | | | | | |
| 20 | Female | 32 | 10 | | | 68.4 | 0.023 | 53.6 | 0.038 |
| 21 | Male | 32 | 32 | 58.8 | 0.053 | 64.1 | .031 | 51.7 | .043 |
| 0.3 ppm fluoride ² | | | | | | | | | |
| 22 | Female | 48 | 48 | | | 60.5 | 0.048 | | |
| 23 | Male | 53 | 24 | 59.7 | 0.046 | 54.4 | .056 | 47.3 | 0.050 |
| 24 | Male | 59 | 57 | | | | | 46.2 | .093 |
| 25 | Female | 74 | 25 | 59.0 | .078 | 57.9 | .089 | 43.7 | .077 |
| 0.1-0.4 ppm fluoride | | | | | | | | | |
| 26 | Male | 32 | 32 | | | 56.2 | 0.062 | 45.4 | 0.061 |
| 27 | Female | 40 | 10 | | | 60.6 | .071 | 49.8 | .111 |
| 28 | Male | 44 | 10 | | | 53.4 | .039 | 46.4 | .042 |
| 29 | Male | 57 | 34 | | | 60.2 | .039 | 44.9 | .040 |
| 30 | Male | 59 | 10 | | | 54.4 | .078 | 48.5 | .094 |
| 31 | Male | 64 | 10 | | | 60.4 | .064 | 51.4 | .075 |
| 32 | Male | 71 | 10 | | | 60.0 | .069 | 45.3 | .083 |
| 33 | Male | 74 | 20 | | | 51.3 | .106 | 49.8 | .119 |
| Mean | | 55.5 | 28.1 | 57.4 | .041 | 58.8 | .050 | 49.0 | .054 |
| SE | | 2.8 | 3.4 | .3 | .003 | .7 | .004 | .6 | .005 |

¹ Resident of Baltimore, Md.; water fluoridated to 1 ppm in November 1952; received fluoridated water for 2 years.

² Residents of Washington, D. C.; water fluoridated to 1 ppm in June 1952; received fluoridated water 4, 2, 3, and 3 years, respectively.

The intervertebral cartilage was separated from the vertebra, and all specimens were cleaned of adhering soft tissues. Each sample was dried overnight at 105° C., broken into pieces, and extracted with alcohol for 8 hours and with ether for 4 hours. After the sample was ground to pass a 60-mesh sieve, a portion was ashed for 3 hours at 550° C. and analyzed for fluoride (9-11). The significance of the differences in means was calculated according to Fisher's *t* test for paired values. The sodium, potassium, calcium, magnesium, phosphorus, carbon dioxide, and citrate contents of these tissues will be reported later.

Bone Fluoride

The percentages of ash and fluoride in dry, fat-free bones for each individual in the study, grouped according to the level of fluoride in the drinking water, are recorded in tables 1 through 4. Ages and years of residence are also given, but it is not possible to detect any definite relation between the fluoride concentration and these factors.

The fluoride values for the 15 bones from the individuals who had a malignancy or renal disease were within the variations encountered for others in the same group (subject No. 5 in table 1; subjects Nos. 8, 10, and 11 in table 3; iliac crest, subject No. 1 in table 4) or slightly higher (subject No. 2 in table 2; rib and vertebra, subject No. 1 in table 4). No significance can be attached to the somewhat higher values since they occurred in individuals from the two

smaller groups (tables 2 and 4). Moreover, approximately a tenfold increase in fluoride concentration of the bones from the lowest to the highest fluoride areas (tables 1 and 4) was seen without any apparent tissue damage.

Less Than 1 ppm Fluoride

Individuals exposed to less than 1 ppm fluoride were residents of several localities, with fluoride concentrations in the drinking water varying from 0.1 ppm in New York City to 0.4 ppm in San Antonio, Tex. The mean was 0.2 ppm. Five persons in this group, aged 32 through 74 years, drank water fluoridated to 1 ppm fluoride for 2 to 4 years. The fluoride content of the bones of these five was within the variations encountered in other samples in this group (table 1).

On a dry, fat-free basis, the mean concentrations of fluoride in the various bones of individuals exposed to less than 1 ppm fluoride were similar, 0.041, 0.050, and 0.054 percent for the iliac crest, the rib, and the vertebra, respectively. As expected, the fluoride concentrations of the rib and the vertebra were generally highest in the individuals from San Antonio.

Five samples of sternum from this group varied from 0.040 to 0.101 percent fluoride with a mean, \pm standard error, of 0.066 ± 0.012 percent (not including one inordinately high value of 0.229 percent fluoride). On an ash basis, they ranged from 0.078 to 0.188 with a mean of 0.134 percent. The mean concentration of fluoride in the ash of the vertebra (0.112 ± 0.010

Table 2. Percentage ash and fluoride in dry, fat-free bones of individuals ingesting drinking water containing 1 ppm fluoride, Grand Rapids, Mich.¹

| Subject No. | Sex | Age (years) | Residence (years) | Iliac crest | | Rib | | Vertebra | |
|-------------|--------|-------------|-------------------|-------------|----------|------|----------|----------|----------|
| | | | | Ash | Fluoride | Ash | Fluoride | Ash | Fluoride |
| 1 | Female | 64 | 12 | | | 57.8 | 0.135 | 45.9 | 0.130 |
| 2 | Female | 64 | 15 | 61.9 | 0.176 | 59.7 | .195 | 48.4 | .238 |
| 3 | Male | 82 | 10 | 59.5 | .137 | 54.5 | .119 | 51.3 | .140 |
| 4 | Female | 83 | 20 | 61.1 | .137 | | | 53.3 | .135 |
| 5 | Male | 85 | 50 | 62.2 | .100 | 57.4 | .106 | 50.9 | .159 |
| | Mean | 75.6 | 21.5 | 61.2 | .138 | 57.4 | .139 | 50.0 | .160 |
| | SE | 1.5 | 7.4 | .6 | .016 | 1.1 | .020 | 1.3 | .020 |

¹ Fluoride added to drinking water January 1945. Subjects received fluoridated water for 12 years with exception of male aged 82 years.

percent) was similar to that of the sternum ash (0.134 ± 0.023 percent), but it was significantly higher than that in the ash of the iliac crest (0.072 ± 0.006 percent, $P < 0.01$) or in the rib (0.086 ± 0.008 percent, $P < 0.05$).

While ash concentrations of the vertebra and the sternum were similar (49.0 percent and 49.4 percent), they were significantly lower than that of the iliac crest (57.4 percent, $P < 0.01$) or the rib (58.8 percent, $P < 0.01$).

Fluoride Level of 1 ppm

A second group, composed of 5 persons, were residents of Grand Rapids, Mich., where the water supply was fluoridated to 1 ppm in January 1945. The autopsy specimens were obtained between November 1956 and January 1957; thus exposure to 1 ppm fluoride was for a maximum of 12 years during the last years of life.

As with the low-fluoride group, no differences were found in the concentration of fluo-

ride in the various bones of this group (table 2). On a dry, fat-free basis, the mean percentages were 0.138 for the iliac crest, 0.139 for the rib, and 0.160 for the vertebra. The fluoride concentrations of the ash of the iliac crest (0.225 ± 0.026 percent) and of the rib (0.241 ± 0.030 percent) were similar, but they were significantly lower than that of the vertebra (0.323 ± 0.043 percent, $P < 0.05$). Appreciable amounts of fluoride thus accrued during the last 10 to 12 years of life of these 5 individuals aged 64 through 85 years.

For the 5 exposed to 1 ppm fluoride, the concentrations of ash in the iliac crest (61.2 percent) and the rib (57.4 percent) were similar but significantly higher than that of the vertebra (50.0 percent, $P < 0.01$).

Fluoride Level of 2.6 ppm

Colorado Springs, Colo., and Amarillo, Tex., were the residences of 27 subjects. Colorado Springs has had a uniform and verified history

Table 3. Percentage ash and fluoride in dry, fat-free bones of individuals ingesting drinking water containing a mean of 2.6 ppm fluoride, Colorado Springs, Colo., and Amarillo, Tex.

| Subject No. | Sex | Age (years) | Residence (years) | Iliac crest | | Rib | | Vertebra | |
|-------------|--------|-------------|-------------------|-------------|----------|------|----------|----------|----------|
| | | | | Ash | Fluoride | Ash | Fluoride | Ash | Fluoride |
| 1 | Male | 36 | 10 | 59.6 | 0.095 | 57.8 | 0.106 | 47.3 | 0.098 |
| 2 | Male | 36 | 36 | 58.9 | .092 | 61.1 | .103 | 49.7 | .145 |
| 3 | Female | 47 | 10 | 57.3 | .219 | 59.7 | .194 | 54.3 | .239 |
| 4 | Female | 47 | 15 | 61.4 | .481 | 66.7 | .370 | 56.8 | .521 |
| 5 | Male | 50 | 10 | 57.9 | .129 | 58.3 | .199 | 52.7 | .179 |
| 6 | Female | 53 | 22 | 61.2 | .111 | 62.2 | .134 | 52.4 | .163 |
| 7 | Female | 54 | 20 | 62.0 | .247 | 65.0 | .179 | 53.8 | .332 |
| 8 | Male | 54 | 20 | | | 56.1 | .269 | 43.7 | .325 |
| 9 | Male | 56 | 10 | 57.3 | .141 | 55.1 | .104 | 44.9 | .150 |
| 10 | Male | 57 | 46 | 58.2 | .288 | 59.5 | .278 | 32.7 | .197 |
| 11 | Male | 58 | 25 | | | 58.9 | .391 | 45.0 | .334 |
| 12 | Female | 63 | 25 | 60.0 | .297 | 58.0 | .279 | 47.8 | .305 |
| 13 | Male | 65 | 30 | 60.0 | .268 | 56.9 | .276 | 47.9 | .299 |
| 14 | Female | 66 | 10 | 62.7 | .214 | 59.4 | .194 | 44.3 | .244 |
| 15 | Female | 69 | 28 | 59.9 | .458 | 58.2 | .453 | 50.7 | .548 |
| 16 | Male | 71 | 36 | 53.3 | .454 | 57.2 | .363 | 47.2 | .400 |
| 17 | Female | 75 | 16 | 60.8 | .237 | 59.3 | .244 | 42.6 | .262 |
| 18 | Male | 76 | 76 | 61.6 | .371 | 55.5 | .347 | 54.0 | .346 |
| 19 | Male | 79 | 40 | 61.7 | .176 | 59.4 | .161 | 47.3 | .189 |
| 20 | Female | 80 | 13 | 60.4 | .190 | 59.5 | .205 | 50.2 | .293 |
| 21 | Female | 81 | 52 | 60.1 | .321 | 59.3 | .293 | 36.6 | .264 |
| 22 | Female | 82 | 76 | 56.4 | .334 | 52.3 | .338 | 46.0 | .382 |
| 23 | Female | 83 | 54 | 62.0 | .325 | 62.4 | .267 | 51.9 | .367 |
| 24 | Female | 83 | 60 | 58.6 | .348 | 62.4 | .373 | 56.1 | .363 |
| 25 | Male | 84 | 32 | 60.9 | .154 | 58.6 | .121 | 53.7 | .177 |
| 26 | Female | 84 | 62 | 59.3 | .431 | 61.7 | .443 | 45.4 | .321 |
| 27 | Male | 90 | 55 | 60.9 | .304 | 62.2 | .245 | 48.1 | .295 |
| Mean | | 65.9 | 32.9 | 59.7 | .267 | 59.7 | .257 | 48.3 | .286 |
| SE | | 3.0 | 4.0 | .4 | .023 | .6 | .020 | 1.1 | .023 |

Table 4. Percentage ash and fluoride in dry, fat-free bones of individuals ingesting drinking water containing a mean of 4.0 ppm fluoride, Lubbock, Tex.

| Subject No | Sex | Age (years) | Residence (years) | Iliac crest | | Rib | | Vertebra | |
|------------|--------|-------------|-------------------|-------------|----------|------|----------|----------|----------|
| | | | | Ash | Fluoride | Ash | Fluoride | Ash | Fluoride |
| 1 | Male | | | | | | | | |
| 2 | Male | 26 | 17 | | | | | | |
| 3 | Male | 53 | 10 | 58.6 | 0.445 | 62.8 | | | |
| 4 | Female | 71 | 48 | 60.8 | .374 | 54.5 | 0.458 | 51.2 | 0.564 |
| | | 74 | 10 | 62.1 | .542 | 53.3 | .401 | 47.5 | .348 |
| | | | | 58.1 | .291 | 59.4 | .449 | 59.9 | .470 |
| | Mean | | | | | | .284 | 44.3 | .261 |
| | SE | 56 | 21.3 | 59.9 | .413 | | | | |
| | | 11 | 9.1 | .9 | .053 | 57.5 | .398 | 50.7 | .411 |
| | | | | | | 2.2 | .040 | 3.4 | .068 |

of 2.5 ppm fluoride within narrow limits for some 75 years (12, 13). The fluoride level of the water of Amarillo from 1934 to 1948 ranged from 3.6 ppm to 6.2 ppm (14). According to a personal communication from the city chemist, 33 new wells were added between 1948 and 1953, and the fluoride level ranged from 2.6 to 3.2 ppm. In 1955 and 1956 the water supply of Carson County, which probably contains less than 1 ppm fluoride inasmuch as Dean (15) considered the incidence of mottled enamel virtually negative, was developed to augment that of Amarillo. In 1957, 92 wells were pumping into the Amarillo reservoir, and the fluoride content averaged 1.6 ppm. From 1948 to 1957, the fluoride level of the drinking water in Amarillo averaged 2.8 ppm, and the weighted mean for the two cities was 2.6 ppm.

For the 27 individuals, the mean fluoride concentration, on a dry, fat-free basis, of the iliac crest was 0.267 percent; of the rib, 0.257 percent; and of the vertebra, 0.286 percent (table 3). On an ash basis, the mean concentration of fluoride in the vertebra (0.598 ± 0.015 percent) was significantly higher than that in the iliac crest (0.450 ± 0.040 percent, $P < 0.01$) or in the rib (0.432 ± 0.036 percent, $P < 0.01$). The concentration of ash in the iliac crest and the rib (59.7 percent) was significantly higher than that in the vertebra (48.3 percent, $P < 0.01$).

Fluoride Level of 4.0 ppm

Prolonged exposure to about 4.0 ppm fluoride in the drinking water took place in Lubbock, Tex., now the largest community in the United States reported to have this much fluoride. Because of the unusually high fluoride content of

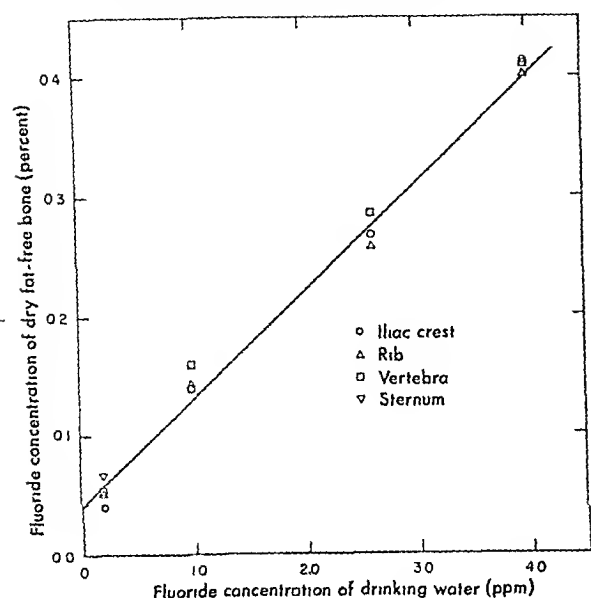
its drinking water, Lubbock, as well as Amarillo, has been the scene of a number of previous studies of the effects of fluoride (14-18). The water fluoride of Lubbock up to 1948 ranged from 3.5 to 4.4 ppm (14). In a recent letter from the Lubbock City-County Health Department, the fluoride content of the water supply from storage reservoirs was reported to have varied from 3.1 to 5.2 ppm from 1948 through 1955, with a mean of 4.0 ppm. The four subjects from Lubbock were autopsied from May through July 1955.

For the Lubbock residents as for the other subjects, the fluoride concentrations of the dry, fat-free iliac crest, rib, and vertebra were not significantly different, being 0.413, 0.398, and 0.411 percent, respectively. Although the concentration of fluoride in the ash of the vertebra (0.802 ± 0.109 percent) was greater than that of the iliac crest (0.637 ± 0.081 percent) or that of the rib (0.629 ± 0.095 percent), the difference was not significant ($P > 0.05$). The ash content of the iliac crest (59.9 percent) and that of the rib (57.5 percent) were similar but higher than the ash content of the vertebra (50.7 percent). An unusually high value of 59.9 percent ash for a specimen of vertebra prevented any level of significance being attached to the difference in the mean ash content of the various bones.

Group Comparison

To summarize these data, the mean concentrations of fluoride in the various bones were plotted against the fluoride level of the drinking water to which the individuals were exposed (see chart). The result indicates that the relation between fluoride in the bones and fluoride

Relation of fluoride in dry, fat-free bones to fluoride in drinking water.



in the drinking water up to 4.0 ppm is adequately described by a straight line function.

Other Findings

The concentration of fluoride in the dry, fat-free intervertebral cartilage also appeared to increase somewhat with elevated levels of water-borne fluoride (table 5). Calcification of this tissue, however, appears not to have been affected by the fluoride concentration of the drinking water.

In addition to the fluoride and ash analyses reported in the preceding tables, it may be of interest to note that the fat content of neither the bones nor the intervertebral cartilage was

related to the fluoride content of the drinking water. The mean concentrations of fat in the oven-dry bones had the following range:

| | Fat content (percent) | |
|-----------------------------|-----------------------|----------|
| | Lowest | Highest |
| Iliac crest..... | 23.2±5.7 | 35.3±2.6 |
| Rib..... | 23.4±3.6 | 30.2±5.7 |
| Vertebra..... | 32.2±7.6 | 43.8±4.3 |
| Sternum ¹ | 41.3±4.3 | 41.3±4.3 |
| Intervertebral cartilage... | 1.8±.2 | 3.3±.8 |

¹ Only one fluoride group examined.

Discussion

The fluoride concentrations in the bones examined in the present study from both low-fluoride areas and high-fluoride areas approximate those observed in the previous limited studies (tables 6 and 7). For one resident of London, a low-fluoride area, a very high value of 0.687 percent fluoride in rib ash was obtained (7). The highest concentration of fluoride found in the present study in bones of individuals who had been drinking water containing less than 1.0 ppm fluoride was 0.428 percent in a sample of ashed sternum, and the next high value was 0.238 percent fluoride for a sample of vertebral ash. In considering the data for high-fluoride areas, some reservations must be attached to the high values presented by Kilborn and associates (5), since these results may have been due to the subnormal living standards and the low nutritional status of this area (Chengtu, China).

Fluoride in the drinking water up to 4.0 ppm did not affect the ash content of any of the bones analyzed.

For any given level of fluoride in the drinking water, the mean concentrations of fluoride in the

Table 5. Percentage ash and fluoride in intervertebral cartilage in relation to fluoride level of drinking water

| Fluoride level of water (ppm) | Number of samples | Dry, fat-free basis | | Ash basis |
|-------------------------------|-------------------|---------------------|-------------|-------------|
| | | Ash | Fluoride | Fluoride |
| <1.0..... | 29 | 4.8±0.3 | 0.003±0.000 | 0.049±0.008 |
| 1.0..... | 5 | 3.9±.3 | .004±.001 | .090±.029 |
| 2.6..... | 26 | 3.8±.2 | .004±.001 | .098±.015 |
| 4.0..... | 1 | 4.2±.1 | .007±.003 | .159±.056 |

NOTE: Data are expressed as mean±standard error.

Table 6. Percentage fluoride in human bone ash from low-fluoride areas

| Fluoride level of water (ppm) | Bone | Number of samples | Fluoride in bone ash (percent) | Source of data |
|---|-------------------|-------------------|--------------------------------|---------------------------|
| 0.0----- | Rib----- | 1 | 0.01 | Boissevain and Drea (3). |
| | Humerus----- | 1 | .1 | Do. |
| | Tibia----- | 1 | .02 | Do. |
| | "Toe"----- | 1 | .16 | Do. |
| Not given, presumably low. ¹ | Skull----- | 1 | .059 | Klement (19). |
| | "Long bones"----- | (2) | .070 | Do. |
| | Rib----- | 11 | 0.048-.21 | Roholm (1). |
| | Iliac crest----- | 13 | .028-.128 | Martin (8). |
| 0.1----- | Rib----- | 83 | .006-.252 | Smith and associates (7). |
| | Vertebra----- | 83 | .005-.331 | Do. |
| 0.0-0.5----- | Rib----- | 25 | .115-.687 | Glock and associates (6). |
| | Iliac crest----- | 20 | .034-.132 | Present study. |
| 1.0----- | Rib----- | 30 | .033-.207 | Do. |
| | Vertebra----- | 31 | .040-.238 | Do. |
| | Sternum----- | 5 | .078-.188 | Do. |

¹ Designated as "normal" individuals.² Not given.³ Data originally given on dry, fat-free basis; calculated to ash basis assuming mean ash value of 59.0 percent for iliac crest from present study.

Table 7. Percentage fluoride in human bone ash from high-fluoride areas

| Fluoride level of water (ppm) | Bone | Number of samples | Fluoride in bone ash (percent) | Source of data |
|-------------------------------|--------------------|-------------------|--------------------------------|--------------------------------------|
| 2.0----- | Rib----- | 4 | 0.12 -0.35 | Boissevain and Drea (3) |
| 5.9 and 6.3----- | Miscellaneous----- | 15 | 1.47 -2.21 | Kilborn and associates (5) |
| | Sternum----- | 1 | .69 | Linsman and McMurray (4). |
| 4.4-12.0----- | Vertebra----- | 1 | .75 | Do. |
| 8.0----- | Miscellaneous----- | 8 | .715-.967 | McClure and associates. ¹ |
| | Iliac crest----- | 33 | .157-.872 | Present study. |
| 1.0-4.0----- | Rib----- | 35 | .150-.843 | Do. |
| | Vertebra----- | 36 | .208-1.103 | Do. |

¹ This issue of *Public Health Reports*, pp. 741-746.

dry, fat-free iliac crest, rib, and vertebra were similar. On an ash basis, however, the fluoride concentration of the vertebra was significantly higher than that of the rib at fluoride levels up to 2.6 ppm. At higher amounts of fluoride in the drinking water, this difference did not obtain.

Previous studies dealing with fluoride deposition in the white rat (20-22) and urinary fluoride excretion by the rat (23) and by man (24,25) have indicated that as bone ages it may lose some of its capacity to store fluoride. This decrease in fluoride deposition with increasing age has been presented in graphic form by Hodge (26) based on the data on man of Smith and associates (7). In the present study, most of the subjects were of advanced age, and the

means for the four groups varied only from 55.5 to 75.6 years. Hence, on the one hand, it was unlikely that a relation between fluoride deposition and age would be apparent; on the other hand, the age factor would tend not to bias any relation between bone fluoride and water fluoride.

From this extensive survey on the fluoride content of human skeletal tissues, it appears that the deposition of fluoride is directly related to the fluoride content of the drinking water up to 4.0 ppm. The deposition of fluoride in dentin and enamel is also elevated proportionately with an increasing concentration of fluoride in the drinking water (27).

There is no indication in these data or in those of previous studies that these human calcified

tissues approach their theoretical capacity of about 3.5 percent fluoride, although drinking water containing as much as 4.0 ppm fluoride was ingested. Prolonged exposure to the water of Colorado Springs, Colo., and Amarillo, Tex. (2.6 ppm fluoride), and to that of Lubbock, Tex. (4.0 ppm fluoride), elevated the fluoride content of the bone ash to a maximum of 1.080 and 1.103 percent, respectively.

The data from the five subjects of Grand Rapids, Mich., are of special interest. Exposure to water containing 1 ppm fluoride did not exceed 12 years, and the average age of the subjects at the time they started to use fluoridated water was about 63 years. Nevertheless, a mean concentration of 0.146 percent fluoride on a dry, fat-free basis was found in these relatively old bones, compared with an average value of 0.049 percent in the bones of individuals of an average age of 56 years ingesting water containing less than 1.0 ppm fluoride.

The fluoride data in the present study coupled with the microscopic findings on essentially the same individuals constitute substantial evidence that a concentration of fluoride as high as 0.548 percent in the dry, fat-free bone and 1.080 percent in the bone ash (for subjects in both studies) may be present without producing any apparent tissue damage.

Summary

Selected bones and skeletal tissue—iliac crest, rib, vertebra, sternum, and intervertebral cartilage—obtained from 69 individuals 26 through 90 years of age who had drunk water containing 0.1 to 4.0 ppm fluoride for at least 10 years were analyzed for ash and fluoride. These bones, which showed no significant histological changes, contained up to 0.548 percent fluoride on a dry, fat-free basis and 1.080 percent fluoride on an ash basis. The mean ash content of the iliac crest and ribs varied from 57.4 to 61.2 percent and that of the sternum and vertebra from 44.6 to 53.7 percent.

At any given level of fluoride in the drinking water, the various bones contained, on a dry, fat-free basis, similar concentrations of fluoride. The fluoride concentration of the intervertebral cartilage was considerably less than that of the bones.

The concentration of fluoride in the bones increased in an essentially linear fashion with an increase of fluoride in the drinking water up to 4.0 ppm.

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Training in Radiological Health

Sanitary Engineering Center. A course in the medical and biological aspects of radiological health will be given at the Robert A. Taft Sanitary Engineering Center, Public Health Service, October 20-31, 1958. Designed for medical, dental, and biological personnel responsible for program decisions in Federal, State, and local health agencies, the course will present data pertinent to radiological health program planning, with emphasis on radiation exposure in the healing arts.

Areas to be covered include biological effects of radiation, philosophy and procedures of radiation protection, practical methods of reducing exposure from medical and dental X-rays, administrative problems of a radiological health program, and the current status of legislative and regulatory procedures.

No previous formal training in radioactivity or radiation is necessary, and there are no tuition or fee charges. Application forms and further information concerning the course may be obtained from the Robert A. Taft Sanitary

Engineering Center, 4676 Columbia Parkway, Cincinnati 26, Ohio.

University of Pittsburgh. Beginning in 1958-59, 2- and 3-year courses in the health aspects of nuclear technology leading to master's and doctor's degrees will be offered by the Graduate School of Public Health. Although focused on occupational and health aspects of nuclear reactors, the new program will cover the fields of health physics and radiation biology. In addition to graduate school facilities, other University Medical Center facilities and some community installations will be used.

Pittsburgh's radiation health training program, located in the department of occupational health, was made possible by a 10-year grant from the Rockefeller Foundation. An additional grant of \$30,000 awarded by the Atomic Energy Commission will be used for equipment and instruments.

Applications and more information may be obtained from the Secretary, Graduate School of Public Health, University of Pittsburgh, Pittsburgh 13, Pa.

Chemical analyses of the bones of two women indicate that human bone may contain as much as 0.5–0.6 percent fluoride without being adversely affected.

Excessive Fluoride in Water

and Bone Chemistry

Comparison of two cases

F. J. McCLURE, Ph.D., H. G. McCANN, M.S., and N. C. LEONE, M.D.

CHEMICAL analyses of skeletal tissues of two women have provided new data on the effect on bone composition of excessive amounts of fluoride in drinking water. One of these women, subject A, 74 years old, lived for 24 years prior to death in Washington, D. C., where the drinking water contained 0.2 ppm fluoride. The other, subject B, died at 78 years after 34 years of residence in Bartlett, Tex., where the drinking water contained 8.0 ppm fluoride. Subject B, whose death was caused by a cerebral vascular accident, was a member of a population group previously studied (1). Subject A died of a heart attack.

The ingestion of fluoride and its concomitant occurrence in the animal body has been studied previously and extensively by the analysis of various tissues of cattle, sheep, swine, and small laboratory animals (2–12). Similar data for man, however, are limited and apply practically entirely to the bones and teeth.

The authors are all with the National Institute of Dental Research, Public Health Service. Dr. McClure is chief, and Mr. McCann is a staff member of the Laboratory of Biochemistry. Dr. Leone is chief of medical investigations.

Roholm (2) tabulated the results of the fluoride analyses of human tissues available in the literature up to 1937. His fluoride data, expressed as a percentage of the bone ash, are considered normal for the bones of adults without unusual exposure to the mineral. Values ranged from 0.05 to 0.21 percent fluoride.

He also reported the fluoride content of bones of two men who had been employed in the handling of cryolite and were thereby exposed to excessive quantities of the dust of this fluoride-containing mineral. The ash of bone specimens from these two cryolite workers contained as much as 1.31 percent fluoride.

Boissevain and Drea (13) reported 0.12–0.35 percent fluoride in ash of human rib bones after 15–40 years of exposure to a domestic water containing 2.5 ppm fluoride. They found 0.07 percent fluoride in ash of one human rib with no known exposure to a fluoride drinking water. Linsman and Murray (14) attributed a case of so-called fluoride osteosclerosis to the use of drinking waters containing 4.4–12.0 ppm fluoride. The ash of the sternum and that of lumbar vertebral body were reported to contain 0.69 and 0.75 percent fluoride respectively.

In 1938 Wolff and Kerr (15) analyzed the

skeletal tissues of a man, 48 years of age, exposed almost daily for 18 years to the dust of rock phosphate (3.88 percent fluoride). According to their data, based on 9 different bone specimens, 0.18-0.70 percent fluoride was present in the dry, fat-free bone.

Kilborn and co-workers (16) observed not only a high incidence of mottled enamel in the inhabitants of a remote province of China but also a chronic skeletal disease which they attributed to fluorosis. The drinking water used in two villages contained 6.3 and 5.9 ppm fluoride. A native of one of these villages, a 37-year-old man, was autopsied after accidental death. Sixteen different bones from this man averaged 1.27 percent fluoride in the dry bone and 1.91 percent fluoride in the bone ash. The results varied from 0.97 to 1.50 percent fluoride in dry bone and from 1.47 to 2.20 percent fluoride in bone ash.

The fluoride in the ribs of humans of different ages with no known abnormal exposure to fluoride was studied by Glock and associates (17). Although considerable variation occurred, there is evidence of an increase in skeletal fluoride concomitant with advancing age. Their results, which appear to be somewhat high, are:

| Age (years) | Percent fluoride in fat-free bone | Percent bone ash |
|-------------|-----------------------------------|------------------|
| Under 1 | 0.024 | |
| Under 1 | .033 | |
| 2 | .06 | 0.115 |
| 15 | .088 | .174 |
| 22 | .18 | .397 |
| 25 | .061 | |
| 27 | .28 | .591 |
| 32 | .089 | .194 |
| 37 | .31 | .687 |
| 37 | .15 | .280 |
| 54 | .23 | |
| 59 | .09 | .186 |
| 60 | .23 | .473 |
| 68 | .18 | .380 |

This relation to age has been studied more recently by Smith and associates (18). In the age group 81-90 years, the fluoride in skeletal ash averaged a little more than 0.128 percent but ranged from 0.034 to 0.331 percent for 10 samples of rib and vertebra. Although marked variations thus occurred in the data for individuals of the same chronological age, these authors state that there is "a striking approximation to a linear relationship for the average

bone fluoride concentrations when 10-year age groups are plotted against the logarithm of the age." These normal accumulations of skeletal fluoride were associated with the use of a drinking water containing 0.06 ppm of fluoride.

In a more recent study, the fluoride content of the iliac crest was found to vary from 0.0164 to 0.0505 percent on dry, fat-free bones in persons aged 32-84 years who had no known exposure to a fluoride water (19). Extensive data on the relation between fluoride in drinking water and fluoride in skeletal tissues are reported by Zipkin and associates (see pp. 732-740 of this issue of *Public Health Reports*).

It is evident from these bone analyses that fluoride may accumulate in skeletal tissues concomitant with the ingestion of fluoride. The presence of relatively large quantities of fluoride in drinking water would be expected to cause marked increases in skeletal fluoride after a prolonged exposure. This was found to have occurred in the woman of this study exposed to high-level fluoride water.

While a major interest in the chemistry of these human skeletal tissues is the extent of fluoride accumulations, it was our purpose also to throw some light on the relation of fluoride to other bone elements, particularly those concerned with calcification. Accordingly, the ash, calcium, phosphorus, magnesium, and carbon dioxide contents of the bones were determined.

Methods and Results of Analyses

For the chemical analyses, the bones were reduced to small pieces; the fat was extracted with alcohol and ether; and the sample was ground to pass a 60-mesh sieve and then dried at 110° C. A temperature of 600° C. was maintained in the electric muffle furnace for ashing. Fluoride was determined on the ashed sample by standard procedures (20, 21), which require steam distillation using perchloric acid and titration of the fluoride evolved in the distillate with standard thorium nitrate. In addition to fluoride, calcium was determined on the ashed samples by triple precipitation of the oxalate from acid solution by slow addition of NH_4OH to avoid contamination with phosphate and to assure good separation of mag-

Table 1. Composition of skeletal tissues (dry, fat-free) of two adults with extremes of fluoride exposure

| Bone specimen | Percent ash | | Percent calcium | | Percent phosphorus | | Calcium/phosphorus | | Percent magnesium | | Percent carbon dioxide | | Percent fluoride | |
|-------------------------------|----------------|----------------|-----------------|-------|--------------------|-------|--------------------|------|-------------------|------|------------------------|------|------------------|-------|
| | A ¹ | B ² | A | B | A | B | A | B | A | B | A | B | A | B |
| Femur..... | 68.73 | 70.94 | 26.46 | 26.71 | 11.70 | 11.71 | 2.26 | 2.28 | 0.37 | 0.35 | 3.93 | 3.95 | 0.062 | 0.551 |
| Tibia..... | 65.14 | 71.65 | 24.92 | 26.97 | 11.11 | 11.81 | 2.24 | 2.28 | .38 | .34 | 3.44 | 4.00 | .067 | .512 |
| Fibula..... | 57.43 | 71.65 | 20.92 | 26.97 | 9.24 | 11.81 | 2.26 | 2.28 | .49 | .39 | 3.70 | 3.96 | .092 | .653 |
| Calvarium..... | 68.10 | 71.44 | 26.12 | 26.79 | 11.61 | 11.87 | 2.25 | 2.26 | .36 | .39 | 3.70 | 3.96 | .092 | .653 |
| Lumbar vertebra..... | 43.39 | 60.24 | 15.69 | 22.38 | 7.46 | 9.45 | 2.10 | 2.37 | .48 | .34 | 1.48 | 3.42 | .077 | .550 |
| Thoracic vertebra..... | 43.39 | 60.84 | 15.69 | 22.66 | 7.46 | 10.01 | 2.10 | 2.26 | .48 | .33 | 1.48 | 3.41 | .077 | .550 |
| Dorsal vertebra..... | 46.38 | 60.84 | 16.72 | 22.66 | 7.50 | 10.01 | 2.33 | 2.26 | .31 | .33 | 2.39 | 3.41 | .086 | .530 |
| Miscellaneous vertebra..... | 46.38 | 58.82 | 16.72 | 21.90 | 7.50 | 9.53 | 2.33 | 2.30 | .31 | .33 | 2.39 | 3.15 | .086 | .530 |
| Rib..... | 54.78 | 66.92 | 21.10 | 25.16 | 9.50 | 11.01 | 2.22 | 2.29 | .35 | .35 | 2.92 | 3.83 | .089 | .630 |
| Right pelvis..... | 54.78 | 67.53 | 21.10 | 24.56 | 9.50 | 10.79 | 2.22 | 2.28 | .35 | .32 | 2.92 | 3.88 | .089 | .577 |
| Acromioclavicular joint..... | 55.86 | 67.53 | 20.27 | 24.56 | 8.84 | 10.79 | 2.29 | 2.28 | .32 | .32 | 3.19 | 3.88 | .078 | .540 |
| Crest of ilium..... | 57.77 | 67.53 | 21.90 | 24.56 | 9.81 | 10.79 | 2.23 | 2.29 | .36 | .32 | 2.93 | 3.19 | .078 | .540 |
| Intervertebral cartilage..... | 6.72 | 5.19 | 1.72 | .61 | .63 | .29 | 2.73 | 2.10 | .13 | .15 | .00 | .20 | .006 | .011 |

¹ Washington, D. C., resident; 0.2 ppm fluoride in drinking water.

² Bartlett, Tex., resident; 8.0 ppm fluoride in drinking water.

nesium (22). Final weighing was as CaF_2 . Magnesium was determined in the filtrate by double precipitation as magnesium ammonium phosphate. Phosphorus was determined on the unashed sample by the molybdovanadophosphate differential spectrophotometric method (23). Carbon dioxide was determined on the unashed samples by evolution with HClO_4 and absorption of the dried gas in a weighing bulb, a modification of the standard procedure (22).

In Table 1 the analytical data are presented

on the dry, fat-free bone. As might be expected, the most remarkable difference in the chemical content of the bones of these two aged adults lies in the fluoride. As much as 0.653 percent fluoride was present in the calvarium of the Bartlett woman, subject B, with a minimum of 0.512 percent fluoride present in the fibula. In striking contrast, the maximum percentage of fluoride in the skeletal tissues of the control, the nonfluoride subject A, was 0.092 percent in the calvarium. The fluoride concen-

Table 2. Composition of bone ash of two adults with extremes of fluoride exposure

| Bone specimen | Percent calcium | | Percent phosphorus | | Calcium/phosphorus | | Percent magnesium | | Percent carbon dioxide | | Percent fluoride | |
|------------------------------|-----------------|----------------|--------------------|-------|--------------------|------|-------------------|------|------------------------|------|------------------|-------|
| | A ¹ | B ² | A | B | A | B | A | B | A | B | A | B |
| Femur..... | 38.49 | 37.65 | 17.02 | 16.51 | 2.26 | 2.28 | 0.53 | 0.49 | 5.72 | 5.57 | 0.090 | 0.771 |
| Tibia..... | 38.25 | 37.65 | 17.06 | 16.51 | 2.24 | 2.28 | .58 | .58 | 5.28 | 5.57 | .103 | .771 |
| Fibula..... | 36.43 | 37.64 | 16.09 | 16.48 | 2.26 | 2.28 | .85 | .47 | 5.58 | 5.58 | .139 | .715 |
| Calvarium..... | 38.36 | 37.50 | 17.05 | 16.62 | 2.25 | 2.26 | .53 | .55 | 5.43 | 5.54 | .135 | .914 |
| Lumbar vertebra..... | 36.16 | 37.15 | 17.19 | 15.69 | 2.10 | 2.37 | 1.11 | .56 | 3.41 | 5.68 | .177 | .913 |
| Thoracic vertebra..... | 36.16 | 37.25 | 17.19 | 16.45 | 2.10 | 2.26 | 1.11 | .54 | 3.41 | 5.60 | .177 | .904 |
| Dorsal vertebra..... | 36.05 | 37.25 | 16.17 | 16.45 | 2.23 | 2.26 | .67 | .54 | 5.15 | 5.60 | .185 | .904 |
| Miscellaneous vertebra..... | 36.05 | 37.23 | 16.17 | 16.20 | 2.23 | 2.30 | .67 | .56 | 5.15 | 5.36 | .185 | .901 |
| Rib..... | 38.52 | 37.60 | 17.34 | 16.45 | 2.22 | 2.29 | .64 | .52 | 5.33 | 5.72 | .162 | .941 |
| Right pelvis..... | 36.37 | 36.37 | 15.98 | 15.98 | 2.28 | 2.28 | .47 | .47 | 5.75 | 5.75 | .855 | .855 |
| Acromioclavicular joint..... | 36.29 | 36.29 | 15.83 | 15.83 | 2.29 | 2.29 | .61 | .61 | 5.71 | 5.71 | .966 | .966 |
| Crest of ilium..... | 37.91 | 36.29 | 16.98 | 15.83 | 2.23 | 2.29 | .62 | .62 | 5.07 | 5.07 | .135 | .135 |

¹ Washington, D. C., resident; 0.2 ppm fluoride in drinking water.

² Bartlett, Tex., resident; 8.0 ppm fluoride in drinking water.

trations in all the different dry, fat-free bone specimens were relatively constant.

Table 2 shows the percentage composition of the bone ash of the two women. It will be noted that the femur and fibula ash of B contained somewhat less fluoride, 0.771 percent and 0.715 percent respectively, than did the other specimens of bone ash of B; which were quite uniform and ranged from 0.855 to 0.966 percent fluoride. The femur ash of A also contained less fluoride than did the ash of other bones. One explanation of this observation may be the higher ash content of these bones.

Some differences in the ash, calcium, and perhaps phosphorus, in addition to fluoride, in the dry, fat-free bones of these two particular women occurred (table 1). In 5 possible comparisons of the same bones from these 2 similar individuals, more ash, calcium, and phosphorus were contained in the bone specimens of B than in those of A. These differences are most pronounced with respect to ash and calcium. There is a suggestion of some elevation in percentage of carbon dioxide in the bones of B compared with A. The calcium-phosphorus ratio and the magnesium content of the two subjects were comparable.

Discussion

The results of the fluoride analyses of these human skeletal tissues agree with previous experimental and clinical evidence that skeletal

tissues become an extensive depository of fluoride. The fluoride accumulations found in B resulted from the prolonged use of a drinking water containing an excessively high concentration of fluoride. As indicated by comparison of the data for these two subjects, this accumulation of fluoride increased slightly the calcification of skeletal tissue.

The ash and perhaps the calcium of dry, fat-free bones of B were slightly higher than the ash and calcium in normal human bones, as shown in table 3. Fluoride analyses of the bone specimens from normal subjects, previously studied by Illinois investigators (24-26), were made at the National Institute of Dental Research. Analytical data for the individual bones of A and B have been averaged and are presented for comparison with the other findings.

There is a remarkably close agreement among the data obtained on the normal men and on our own normal subject A. Whereas the ash values of the bones from these subjects varied from 56.67 to 57.85 percent, the ash content of the bones of subject B averaged 64.91 percent. The calcium averaged 24.16 percent compared with a variation of 21.26 to 22.84 percent in adult bone exposed to low-fluoride water. There is no indication of an effect of fluoride on the calcium, phosphorus, and calcium-phosphorus ratio of the bone ash.

It seems evident, considering the data in table 3, that a slight increase in calcification did occur

Table 3. Comparison of composition of human skeletal tissue exposed to normal and high-fluoride water.

| Subject and exposure | Dry, fat-free bone | | | | | Bone ash | |
|-----------------------------------|--------------------|-------------|-----------------|--------------------|--------------------|-----------------|--------------------|
| | Percent fluoride | Percent ash | Percent calcium | Percent phosphorus | Calcium/phosphorus | Percent calcium | Percent phosphorus |
| Normal water fluoride: | | | | | | | |
| Male, 35 years ¹ | | 56.67 | 21.61 | 9.48 | 2.28 | 38.13 | 16.72 |
| Male, 46 years ² | 0.037 | 56.89 | 22.81 | 9.36 | 2.31 | 40.09 | 17.33 |
| Male, 60 years ³ | .038 | 56.93 | 21.26 | 10.08 | 2.11 | 37.34 | 17.70 |
| Male, 48 years ³ | .077 | 57.85 | 22.84 | 10.30 | 2.22 | 39.48 | 17.80 |
| Female A, 74 years..... | .079 | 57.71 | 21.72 | 9.74 | 2.23 | 37.63 | 16.87 |
| Average of normal exposures.. | .058 | 57.21 | 22.04 | 9.89 | 2.23 | 38.53 | 17.28 |
| 8.0 ppm water fluoride: | | | | | | | |
| Female B, 78 years..... | .556 | 64.91 | 24.16 | 10.55 | 2.27 | 37.22 | 16.25 |

¹ Reference 24.

² Reference 25.

³ Reference 26.

in the skeletal tissues of B. This is regarded as the result of exposure to excessive water-borne fluoride.

Bone Pathology and Fluoride Content

For previous evidence bearing on the relationship between fluoride content and pathological changes in human bone tissues, we must refer to the early classic studies of Roholm (2). The two autopsy cases he studied represent the characteristic skeletal pathology produced by excessive fluoride. The abnormalities were concomitant with 0.76 to 1.319 percent fluoride present in the ash of the affected bones. An unusually low value of 0.31 percent fluoride is reported for the frontal bone of 1 of these 2 cryolite workers.

The deleterious effects of fluoride, observed in experimental animal studies, have resulted consistently from excessive fluoride exposures, and the observations supply substantial information concerning the relationship between bone fluoride and bone pathology. Swine bones, according to Kick and associates (3), retained upwards of 0.30–0.40 percent fluoride before any toxic effects of fluoride were discernible. In the bones of dairy cattle suffering from extreme fluorosis, the severity of bone exostosis increased directly with the fluoride content, a mild form of exostosis being associated with 0.53 percent fluoride in the bone tissue (9).

Recently Suttie and associates (27) reported that dairy cows tolerated the ingestion of 30 ppm of fluoride in the diet, with a concomitant accumulation of 0.46 percent fluoride in dry, fat-free rib bones. On the basis of the evidence that 0.01–0.15 percent fluorine is present normally in the bone ash of animals, Peirce (6) suggested that the "ingestion of quantities of fluorine which apparently exert no untoward effects on the general health of animals or which bring about no obvious morphological change in its skeleton, may nevertheless increase ten- to fifteen-fold the fluorine content of bones and teeth."

The data available through the present study provide additional evidence regarding the threshold level of fluoride which may be tolerated by human skeletal tissues. As much as 0.5–0.6 percent fluoride in the bones of B did not

prove to be a physiological hazard. This is about 10 times the quantity of fluoride regarded as normal. X-ray examination, medical, and clinical studies made prior to the death of B (1,28) do not reveal any skeletal abnormalities or systemic conditions of consequence to health or well-being which could be directly associated with the remarkable increases in the skeletal fluoride content. Other reports contain extensive information on the relation between fluoride content and bone pathology (see pp. 721–731 and 732–740 of this issue).

It must be concluded in the light of the available evidence that human skeletal tissue may have a very high degree of physiological tolerance to accumulations of fluoride.

Summary

Analytic chemical studies of similar human skeletal tissues obtained at autopsy from two comparable women were conducted to determine the effect of a prolonged exposure to drinking water containing 8.0 ppm of fluoride on the chemistry of human bones.

As a result of the prolonged use of this fluoride drinking water, the fluoride in dry, fat-free skeletal tissues ranged from 0.512 to 0.653 percent, as compared with 0.062 to 0.092 percent fluoride in the skeletal tissues of a subject, comparable in age, height, weight, and sex, with no unusual water-fluoride exposure.

There was some indication that the prolonged use of drinking water containing 8.0 ppm fluoride accounted for an increase in the ash and a slight increase in the calcium content of the skeletal tissues.

The absence of any gross or systemic findings, or of any impairment of health or well-being, malformation of the skeletal tissues, or malfunction generally in the one subject studied, indicates that human bone may not be affected by as much as 0.5 to 0.6 percent fluoride. These findings compare favorably with other previous evidence pertinent to human bone as well as fluorosed animal bones.

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TRACE ELEMENTS in BIOLOGY and AGRICULTURE

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FOODS and nutrients are necessary for cell growth because of their function in generation or release of energy, building and repair of protoplasm, and regulation of metabolic processes. They are usually classified as: (a) an energy source, (b) a nitrogen source, (c) growth factors (organic compounds not synthesized by the organism and required usually in small amounts), and (d) mineral salt or inorganic nutrient.

A number of inorganic elements, or minerals, are required by all living forms for normal growth and reproduction. This is not true of all the elements of the periodic table, although most have been found in living cells. The minerals essential to life are generally divided into two classes: macronutrients, or major elements, needed in relatively large amounts, and the micronutrients, or trace elements, required only in small amounts.

For most organisms the macronutrient elements include sulphur, phosphorus, potassium, magnesium, calcium, and nitrogen. In addition, sodium and chloride are needed by animals and, according to recent experiments, probably by plants as well. The trace elements include iron, zinc, manganese, and copper. Molybdenum, boron, and vanadium are

also needed by plants, and iodine, cobalt, and probably molybdenum by animals. Even though micronutrient elements are required in only extremely small quantities, they are no less important than the major elements.

The fact that the trace metals are needed in only small quantities indicates that they are functioning in some catalytic role, usually as part of an enzyme system. In this respect the function of trace elements is similar to that of the organic micronutrients, the vitamins. A known enzymatic role has been described for most of the trace elements. Exceptions are iodine, which is a component of the thyroglobulin molecule, and cobalt, which is part of the vitamin B₁₂ molecule.

Although we can describe a specific function for most of the metals, as long as essential enzyme systems can be activated by a variety of elements we can expect nonessential metals to have a significant effect on the metabolism of plants and animals. There are many examples of multiple-metal effects on enzyme systems, some of the most striking of which are from the area of plant-animal relationship. Judging by the optimum concentration of an element for enzyme activity as well as the ratio of stimulatory and inhibitory metals present, it is evident that under physiological conditions some systems may be working at a maximum rate whereas others may be operating at less than 1 percent of maximum efficiency.

Obviously there must be some balance in the

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soil, in the plant, and in the animal which leads to a normal, healthy individual. However, the difficulty of determining the normal activator of a metabolic system and factors which will influence the rate of reaction *in vivo* is demonstrated by a number of recent experiments.

Is growth or yield an adequate criterion for determining whether the various metabolic systems are functioning at a level to give maximum benefit to the organism? Can we apply trace elements and other fertilizers to the soil and to the diets of animals until we obtain maximum crop yield or maximum growth rate and expect, at the same time, to receive maximum nutritional benefit for the organisms? There are several excellent examples which say we cannot. One might say that these are extreme and special cases. However, it is gradually becoming evident that visual symptoms of plant and animal deficiency are not necessary to prove deficiencies in the health and vigor of the organism. Deficiencies and excesses are a matter of degree, and plants, like animals, may become decidedly inferior in quality long before showing outward signs. Hence, yield or growth is no longer an adequate sign of health.

The next question is, what criteria can be used? From a physiological point of view, criteria must by necessity vary with the nature of the objective. If it is aroma in tobacco that is desired, then a plant that is slightly deficient in sulphur may be essential. If it is tensile strength and kink in wool, then the dietary level of copper may be one of the major factors. Many other examples could be cited.

What seems clear from numerous studies is that certain metabolic characteristics appear under conditions of varying trace-element supply and not merely in association with an overall reduction or increase in mass or quantity. In other words, each level of trace-element supply during growth produces a characteristic metabolic pattern irrespective of the yield. The enzymatic patterns are the real test. Enzyme concentration and activity are changing under all conditions of trace-element nutrition. These changes of enzymatic activity will certainly be of value in the early diagnosis of animal and plant diseases which are not apparent from growth studies, and, as Williams

recently emphasized, each individual represents a special problem (1).

Several general patterns evolve from the physico-chemical and nutritional studies on the influence and mechanism of action of metals in enzyme systems. Although there are exceptions to these generalizations, it appears that those metals most closely associated with electron transferring systems are copper, iron, zinc, and molybdenum. Nonenzymatic studies have shown that these metals have the inherent capacity to function as electron mediators in oxidation-reduction reactions. The important biochemical questions are: (a) why is this capacity for catalyzing oxidation-reduction reactions accentuated in the presence of specific proteins, and (b) what is the nature of the linkages which allow specific coupling of these metal systems to others, which in turn allows the transfer of electrons along specific pathways? The pattern that seems to be emerging is that these metals are not required specifically for the combination of substrate to the catalytic protein but rather that they function primarily as "electron couplers" from one protein system to another.

Tabulated results of studies show that magnesium and, to a certain extent, manganese are required primarily for those reactions involving group transfer, in particular those in which phosphate participates. For example, to metabolize glucose it must be phosphorylated. Phosphate is transferred from adenosine triphosphate to glucose to form glucose-6-phosphate and adenosine diphosphate. Magnesium is required for this group transfer. In recent years it has become increasingly clear that enzymes participate intimately in group transfer by serving as the intermediate carrier. Magnesium plays a predominant role in promoting the formation of the enzyme-substrate complex and the resulting intermediate of the reaction. The presence of a pyrophosphate structure in many of the co-factors and substrates involved in group transfer suggests that a chelate structure with magnesium is probable.

The predominant metal in general enzymatic decarboxylation and hydrolysis reactions is manganese. To a lesser extent zinc and magnesium also are factors. At present there is no general agreement as to the primary mechanism

of action of these metals. Some workers feel that they form an essential structure with the substrate and thus act to bring the substrate into combination with the protein. Others feel that the metal combines with the enzyme and functions primarily to accelerate and therefore to increase the concentration of an essential intermediate in the reaction. Manganese does not have strong inherent properties for catalyzing decarboxylation, whereas other metals, such as copper, which do not function as co-factors in enzymatic decarboxylation, are very effective in nonenzymatic reactions. The suggestion, therefore, that manganese functions in enzyme systems by forming chelate structures with the substrate lacks strong experimental support.

Conclusion

Emphasis in nutrition during the past 30 years has been on identification and establishment of absolute requirements of inorganic and

organic nutrients for "normal" growth and development. Almost by necessity it was assumed that the animals in a population were all identical and therefore had the same nutritional requirements. It is now clear, however, that there are large individual variations in nutritional requirements. In addition, quantitative studies on various tissues indicate that small changes in the diet often lead to dramatic effects on enzyme systems. Thus studies in the future must emphasize the individual.

Nutritional individuality can be an important factor in human health and disease. Small changes in concentration of the trace elements in the diet, for example, will alter the concentration of metabolic intermediates and products formed by an individual. Growth alone, therefore, is not the only criterion that can be used for testing the adequacies of a diet.

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Allocation of Charity Funds for Research

The voluntary health agencies listed below in the United States raised \$116,788,220 in 1956, according to the National Health Education Committee, Inc., New York City. In the same year, \$20,918,043 was allocated for research by the agencies.

| Voluntary agency | Amount raised | Amount allocated for research |
|--|----------------|-------------------------------|
| American Cancer Society | \$27, 234, 612 | \$7, 735, 537 |
| Damon Runyon Fund | 984, 743 | 1, 006, 033 |
| American Heart Association and affiliates | 17, 755, 910 | ¹ 6, 100, 000 |
| National Association for Mental Health | 695, 054 | ² 149, 007 |
| Arthritis and Rheumatism Foundation | 2, 449, 396 | 467, 521 |
| United Cerebral Palsy | 8, 318, 000 | 538, 865 |
| National Multiple Sclerosis Society | 2, 007, 606 | ² 270, 805 |
| Muscular Dystrophy Associations | 4, 191, 109 | 1, 405, 415 |
| National Council to Combat Blindness | 257, 915 | 127, 954 |
| National Society for the Prevention of Blindness | 255, 902 | 47, 667 |
| American Foundation for the Blind | 666, 973 | none |
| National Foundation for Infantile Paralysis | 51, 971, 000 | 3, 069, 239 |
| Total | 116, 788, 220 | 20, 918, 043 |

¹ Not final. ² National office figures only.

Mortality in mental hospital patients is analyzed in an exploration of its relation to changes in the general pattern of mortality.

Mortality in State Mental Hospitals of Michigan, 1950-54

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MODERN science has not only extended average life but also has markedly affected the pattern of mortality in the United States. The effect of demographic factors associated with mental patients on an overall mortality rate and the trends and characteristics of mental hospital mortality have become subjects of interest and curiosity among professional investigators in the mental health field, including demographers (1-5).

The present study compares differential mortality rates among resident patients in Michigan State mental hospitals with those in the general population of Michigan during a 5-year period beginning in 1950. The source for the data on mortality of mental patients is the statistics section of the Michigan Department of Mental Health. Figures for the general population of Michigan for 1950 are from the United States census. To compute death rates, the number of resident patients and the number of people in communities as of June 30 were used as denominators. Analyses and discussions of the data are presented in the following order. First, age-sex composition of the population in order to provide the basic information that would facilitate intelligent discussion of the differential mortality rates observed in two different environments. Second, trends and characteristics of the mortality rates by all

causes of death. Third, trends and characteristics of the mortality rates by selected causes of death. Fourth, diagnosis-specific death rates among patients with different mental disorders. Fifth, psychiatric hospital mortality from the point of view of physical condition and age of patients on admission to the hospital.

Population Characteristics and Deaths

It is estimated that, during the 1950-54 period under study, Michigan's total population increased from 6,371,766 to 7,156,481, or by 12.3 percent. During this period total deaths in Michigan increased from 57,743 to 60,632 or by 5 percent. These changes led to a shift in the crude death rate, which declined from 9.1 to 8.6 per 1,000 of the State population.

In contrast, the number of resident patients in Michigan State mental hospitals increased from 18,738 to 20,031, or by 6.5 percent, while the number of deaths occurring in the hospitals during the same period decreased from 1,455 to 1,348, or by 7.4 percent. This brought about a sharp decline in the crude death rate for the patients from 77.6 in 1950 to 67.2 in 1954.

Examination of the available data indicates that patient movement during the quinquennium has shifted toward the hospitalization of increasingly more women than men in the middle and old age groups. Conversely, there has been increasingly more men than women of young ages in the hospitals for psychiatric treatment.

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Comparison of the general population with the patient population points up two obvious distinctions in the age composition. In the patient population there is an actual and proportionate preponderance in the middle and old age groups, with an extremely small number and proportion of people under 20 years of age, while in the general population, the largest proportion and number is in the youngest age group with a diminishing proportion as the age groups advance. On the other hand, the psychiatric hospital population usually consists of a large proportion of two distinctive diagnostic groups, namely, the schizophrenic patients who are mostly in the productive age groups, and the patients suffering from psychoses associated with senility.

Crude Death Rates by All Causes

The crude death rate, measured as the number of deaths per 1,000 of the total population, usually cannot be taken as an accurate index of the true mortality of the population. However, analyses and discussions of such rates are presented because of their pragmatic utility for health authorities.

Although the hospital population experienced a considerable decrease in the overall death rate, the data reveal no clear-cut and consistent pattern of change. It should be noted, however, that such an overall rate decline was actually accounted for by a remarkable drop in the rate of male patients during this period. Thus, it follows that, although male patients are gener-

ally subjected to a higher mortality than female patients, the death rate difference between the two sexes became continuously less important. On the basis of the 5-year average, approximately 20 more male than female patients per 1,000 died in the course of 1 year.

According to the data in table 1, the magnitude of decrease in the death rate is positively related to the age of the group. Particularly noted are the patients aged 65 and over, who recorded the sharpest decline, from 197.9 to 172.8, a drop of more than 25 deaths per 1,000. With male patients the death rate declined more in the older group than in the younger group, while the reverse was true with female patients, who showed a sharper rate drop in the younger group.

In sharp contrast to what was observed in the hospital population, the general population on the whole did not show a noticeable change in the crude death rate during the period being observed. In fact, in the general population the overall death rate for all causes remained almost unchanged at the level of 10-11 per 1,000. As expected, the male population as a whole always maintained a slightly higher rate of mortality than did the female population. On the 5-year average approximately four more men than women per 1,000 died yearly. Furthermore, both sexes managed to hold a fairly consistent relative position of the rate throughout the entire quinquennium.

The data in table 2 also reveal that the crude death rate for all causes in the general population declined steadily, but slightly, in each of

Table 1. Crude death rate by all causes per 1,000 resident patients, by three broad age groups and sex, 1950-54

| Year | Rate by sex | | | Rate by sex and age group | | | | | | | | |
|--------------|-------------|------|--------|---------------------------|-------|-------------|-------|-------|-------------|--------|-------|-------------|
| | | | | Total | | | Male | | | Female | | |
| | Total | Male | Female | 15-34 | 35-64 | 65 and over | 15-34 | 35-64 | 65 and over | 15-34 | 35-64 | 65 and over |
| 1950----- | 77.7 | 93.6 | 62.2 | 15.2 | 38.0 | 197.9 | 15.4 | 47.7 | 248.1 | 15.1 | 28.2 | 154.3 |
| 1951----- | 83.8 | 91.3 | 76.5 | 15.6 | 37.4 | 221.6 | 17.8 | 40.7 | 247.9 | 13.4 | 34.0 | 197.6 |
| 1952----- | 71.6 | 81.2 | 62.2 | 12.6 | 31.6 | 188.0 | 14.5 | 38.0 | 214.7 | 10.6 | 25.2 | 163.8 |
| 1953----- | 73.8 | 85.9 | 62.2 | 11.2 | 31.9 | 185.3 | 13.1 | 39.1 | 217.4 | 9.2 | 24.9 | 156.4 |
| 1954----- | 67.5 | 74.2 | 61.1 | 8.7 | 29.2 | 172.8 | 10.2 | 33.0 | 193.6 | 7.2 | 25.5 | 154.3 |
| Average----- | 74.9 | 85.2 | 64.8 | 12.7 | 33.6 | 193.1 | 14.2 | 39.7 | 224.3 | 11.1 | 27.6 | 165.3 |

Table 2. Crude death rate by all causes per 1,000 for general population, by three broad groups and sex, 1950-54

| Year | Rate by sex | | | Rate by sex and age group | | | | | | | |
|---------|-------------|------|--------|---------------------------|-------|-------------|-------|-------|-------------|--------|-------|
| | | | | Total | | | Male | | | Female | |
| | Total | Male | Female | 15-34 | 35-64 | 65 and over | 15-34 | 35-64 | 65 and over | 15-34 | 35-64 |
| 1950 | 11.0 | 12.8 | 9.1 | 1.4 | 8.9 | 62.3 | 1.7 | 11.1 | 69.7 | 1.1 | 6.6 |
| 1951 | 11.1 | 12.8 | 9.3 | 1.3 | 8.8 | 61.8 | 1.6 | 10.9 | 68.5 | 1.0 | 6.6 |
| 1952 | 10.9 | 12.7 | 9.1 | 1.3 | 8.7 | 58.8 | 1.7 | 10.8 | 65.3 | .9 | 6.4 |
| 1953 | 11.3 | 13.2 | 9.3 | 1.4 | 8.6 | 60.7 | 1.8 | 10.9 | 67.7 | 1.0 | 6.3 |
| 1954 | 10.9 | 12.8 | 8.9 | 1.2 | 8.2 | 57.9 | 1.6 | 10.4 | 64.9 | .8 | 5.8 |
| Average | 11.0 | 12.9 | 9.1 | 1.3 | 8.6 | 60.3 | 1.7 | 10.8 | 67.2 | 1.0 | 6.3 |

the three broad age groups during the same period. It was found, as in the case of hospital mortality, that the magnitude of a quinquennial rate decline was largest in the oldest age group. Differences in the crude death rates as observed between men and women in the general population seem far less significant than those observed in the hospital population.

In view of the extremely contrasting characteristics of the age-sex composition of the two populations, it was assumed that the crude rate of hospital mortality would far exceed that of general mortality. According to the 5-year average rates, the hospital mortality was found to be 6.8 times as high as the general mortality,

while the difference was slightly greater the female (7.1 times) than for the male (times) population. The death rate difference between the two populations was found to be much greater in the young than in the old group.

Age-Sex Specific and Standardized Rates

Examination of the data in table 3 indicates that in both populations the age-specific and age-sex specific death rates rise increasingly with advance in age. The age-sex specific rate is measured as the number of deaths of a given age-sex group per 1,000 of the population of that age-sex group. Similar to Malzberg's

Table 3. Age-specific and age-sex specific death rate per 1,000 of mental hospital population and general population, 1950-54 average

| Age group | Age-sex specific death rate and ratio | | | | | | | | |
|-----------|---------------------------------------|--------------------|-------|------------------|--------------------|-------|------------------|--------------------|-------|
| | Total | | | Male | | | Female | | |
| | Mental hospitals | General population | Ratio | Mental hospitals | General population | Ratio | Mental hospitals | General population | Ratio |
| 24 | 16.4 | 1.24 | 13.2 | 18.6 | 1.70 | 10.9 | 13.9 | 0.80 | 17.4 |
| 29 | 11.5 | 1.32 | 8.7 | 12.8 | 1.67 | 7.7 | 10.2 | .98 | 10.4 |
| 34 | 12.3 | 1.68 | 7.3 | 13.8 | 2.01 | 6.9 | 11.0 | 1.36 | 8.1 |
| 39 | 12.7 | 2.45 | 5.2 | 14.3 | 2.88 | 5.0 | 11.2 | 2.02 | 5.5 |
| 44 | 16.3 | 3.87 | 4.2 | 14.9 | 4.53 | 3.3 | 17.8 | 3.20 | 5.6 |
| 49 | 22.0 | 6.21 | 3.5 | 25.3 | 7.56 | 3.3 | 18.4 | 4.78 | 3.8 |
| 54 | 30.3 | 9.77 | 3.1 | 36.0 | 12.15 | 3.0 | 25.0 | 7.20 | 3.5 |
| 59 | 42.0 | 14.97 | 2.8 | 51.8 | 19.01 | 2.7 | 33.4 | 10.56 | 3.2 |
| 64 | 72.6 | 22.74 | 3.2 | 90.0 | 28.56 | 3.2 | 55.1 | 16.41 | 3.4 |
| 69 | 95.8 | 33.55 | 2.9 | 110.0 | 41.00 | 2.7 | 80.4 | 25.91 | 3.1 |
| 74 | 161.6 | 49.35 | 3.3 | 197.5 | 58.23 | 3.4 | 127.3 | 40.80 | 3.1 |
| and over | 301.1 | 104.73 | 2.9 | 376.1 | 112.99 | 3.3 | 248.0 | 97.62 | 2.5 |

Table 4. Standardized death rate per 1,000 for resident patients, by three broad age groups and sex, 1950-54

| Year | Standardized ¹ rate by sex | | | Standardized ¹ rate by sex and age group | | | | | | | | |
|--------------|---------------------------------------|-------------------|---------------------|---|-------|-------------|-------------------|-------|-------------|---------------------|-------|-------------|
| | | | | Total ⁴ | | | Male ⁵ | | | Female ⁵ | | |
| | Total ² | Male ³ | Female ³ | 20-34 | 35-64 | 65 and over | 20-34 | 35-64 | 65 and over | 20-34 | 35-64 | 65 and over |
| 1950..... | 39.4 | 48.8 | 30.9 | 15.0 | 31.7 | 178.5 | 15.2 | 39.0 | 235.0 | 14.8 | 24.3 | 130.7 |
| 1951..... | 42.0 | 47.7 | 37.0 | 16.5 | 30.9 | 204.2 | 19.1 | 33.6 | 238.6 | 13.5 | 28.3 | 177.3 |
| 1952..... | 35.3 | 41.5 | 29.8 | 13.2 | 26.6 | 170.7 | 14.7 | 31.2 | 204.0 | 11.8 | 22.2 | 142.5 |
| 1953..... | 35.1 | 42.8 | 28.4 | 13.8 | 25.5 | 172.4 | 16.1 | 31.0 | 213.4 | 11.7 | 20.4 | 138.7 |
| 1954..... | 31.2 | 36.1 | 26.8 | 8.7 | 23.8 | 160.4 | 10.7 | 26.4 | 189.9 | 6.9 | 21.3 | 135.5 |
| Average..... | 36.6 | 43.4 | 30.6 | 13.4 | 27.7 | 177.2 | 15.2 | 32.2 | 216.1 | 11.7 | 23.3 | 144.9 |

¹ Michigan 1940 population used as standard. ² Rates standardized for sex and age. ³ Rates standardized for age. ⁴ Rates standardized for sex and age in a segment of population. ⁵ Rates standardized for age in a segment of population.

findings (6), the largest relative difference in the age-specific and age-sex specific death rates between hospital and general populations was found in the young (20-24) age group. Most important, these specific rates of resident patients were always higher than those of the general population in every age group used in the table.

The mortality trend observed in the hospitals, as indicated by the standardized death rates, was a steady downward movement. The standardized rate is measured per 1,000 of the selected standard population with the adjust-

ment for age or age and sex. From the point of view of demographic significance, this drop is a remarkable change which took place within a period of 5 years beginning in 1950. There was also a considerable rate difference between the patients of different sexes, with the male patients showing a much greater decrease in adjusted mortality than did female patients during the same period.

In all age groups there was a steady and favorable trend in the adjusted mortality. In comparing the three age groups, it was found that the old age group showed a greater decrease

Table 5. Standardized death rate per 1,000 for general population, by three broad age groups and sex, 1950-54

| Year | Standardized ¹ rate by sex | | | Standardized ¹ rate by sex and age group | | | | | | | | |
|--------------|---------------------------------------|-------------------|---------------------|---|-------|-------------|-------------------|-------|-------------|---------------------|-------|-------------|
| | | | | Total ⁴ | | | Male ⁵ | | | Female ⁵ | | |
| | Total ² | Male ³ | Female ³ | 20-34 | 35-64 | 65 and over | 20-34 | 35-64 | 65 and over | 20-34 | 35-64 | 65 and over |
| 1950..... | 11.0 | 13.0 | 9.0 | 1.5 | 8.5 | 62.3 | 1.8 | 10.4 | 71.0 | 1.1 | 6.4 | 54.1 |
| 1951..... | 10.8 | 12.7 | 8.9 | 1.4 | 8.4 | 61.7 | 1.7 | 10.3 | 69.6 | 1.1 | 6.4 | 54.1 |
| 1952..... | 10.4 | 12.3 | 8.5 | 1.4 | 8.3 | 58.3 | 1.7 | 10.2 | 66.0 | 1.0 | 6.2 | 50.9 |
| 1953..... | 10.6 | 12.6 | 8.6 | 1.5 | 8.2 | 59.9 | 1.9 | 10.3 | 68.0 | 1.0 | 6.1 | 52.1 |
| 1954..... | 10.0 | 12.0 | 8.0 | 1.3 | 7.8 | 56.8 | 1.7 | 9.9 | 64.9 | .9 | 5.7 | 49.1 |
| Average..... | 10.6 | 12.5 | 8.6 | 1.4 | 8.2 | 59.8 | 1.8 | 10.2 | 67.9 | 1.0 | 6.2 | 52.1 |

¹ Michigan 1940 population used as standard. ² Rates standardized for sex and age. ³ Rates standardized for age. ⁴ Rates standardized for sex and age in a segment of population. ⁵ Rates standardized for age in a segment of population.

in the mortality rate than did the middle and young age groups.

In terms of adjusted mortality rate, it should be noted that the amount of improvement made by the young female patients was about twice that experienced by young male patients during the 5 years. In contrast, the pattern of such progress was reversed for the male patients in the middle and old age groups. In general the improvement on life expectancy of male patients was much greater than that of the female patients, with a consequent decreasing sex difference in the mortality rate among resident patients.

In short, it is apparent upon examination of the standardized death rates presented in the table that the downward movement of the mortality observed in State mental hospitals was not due to change in age-sex composition of the resident patient population. Rather it was because of the favorable impact of other environmental factors, or such factors as selective intake of patients so that the patients admitted in later years had a smaller risk of death, or to improvement in therapy which enabled patients to accept improved diets, thus improving their health.

In a 5-year comparison of the two popula-

tions, the adjusted hospital mortality rate was found to be 3.6 times as high as the adjusted general mortality rate (table 5), while no overall sex difference was noted. The greatest adjusted rate difference was found in the group aged 20-34 years, although such a discrepancy became consistently smaller during this period.

Crude Cause-Specific Rates

For the purposes of this paper, the definition of a cause of death, taken from the Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death, is "the morbid condition or disease process, abnormality, injury or poisoning leading directly, or indirectly, to death." A systematic classification of the causes of death as tabulated in the detailed list of the International List of Causes of Death was used in this study, and discussion of the basic mortality characteristics and trends is limited to the 12 leading causes of death. The cause-specific rate is measured as the number of deaths from a given disease per 100,000 of the total population.

The causes of death for patients in State mental hospitals show striking variations when compared with those for the general population.

Table 6. Percentage distribution of deaths by 12 leading causes for hospital population and general population, 1950-54

| Major causes of death | Hospital population | | | | | General population | | | | |
|--|---------------------|-------|-------|-------|-------|--------------------|-------|-------|-------|-------|
| | 1950 | 1951 | 1952 | 1953 | 1954 | 1950 | 1951 | 1952 | 1953 | 1954 |
| Tuberculosis (001-008, 010-019)..... | 3.8 | 4.1 | 2.6 | 2.9 | 1.9 | 2.2 | 1.9 | 1.3 | 0.9 | 0.9 |
| Syphilis (020-029)..... | .3 | .3 | .2 | .5 | .7 | .8 | .5 | .3 | .3 | .2 |
| Malignant neoplasms (140-205)..... | 4.3 | 3.1 | 4.2 | 4.9 | 5.8 | 15.4 | 15.9 | 15.9 | 16.2 | 16.9 |
| Diabetes mellitus (260)..... | .1 | .2 | .5 | .3 | .6 | 2.6 | 2.4 | 2.3 | 2.3 | 2.5 |
| Vascular lesions (330-334)..... | 8.4 | 10.5 | 10.4 | 12.3 | 18.1 | 11.1 | 11.1 | 11.1 | 11.3 | 11.3 |
| Arteriosclerotic and degenerative heart disease (420-422)..... | 33.4 | 30.6 | 37.7 | 32.9 | 25.5 | 27.7 | 28.4 | 28.0 | 29.1 | 29.7 |
| Hypertension (440-447)..... | 1.4 | 1.9 | 4.8 | 4.9 | 1.8 | 5.6 | 5.3 | 5.4 | 5.2 | 4.9 |
| Pneumonia (490-493)..... | 16.2 | 16.9 | 17.4 | 15.5 | 15.8 | 2.0 | 2.3 | 2.3 | 4.7 | 2.0 |
| Cirrhosis of liver (581)..... | .4 | .1 | .2 | .5 | .3 | 1.1 | 1.0 | 1.0 | 1.2 | 1.1 |
| Nephritis and nephrosis (590-594)..... | 2.1 | 2.2 | 1.7 | 1.4 | .5 | 1.8 | 1.7 | 1.5 | 2.7 | 1.2 |
| Suicide and self-inflicted injury (970-979)..... | .6 | .5 | .2 | .2 | .2 | 1.3 | 1.1 | 1.2 | 1.2 | 1.2 |
| Accidental deaths (800-802, 810-835, 840-965, 980-984)..... | .4 | .5 | .5 | 1.5 | .7 | 7.1 | 7.2 | 7.1 | 7.5 | 7.0 |
| Subtotal..... | 71.4 | 70.9 | 80.4 | 77.8 | 71.9 | 78.7 | 78.8 | 77.4 | 82.6 | 78.9 |
| Other causes..... | 28.6 | 29.1 | 19.6 | 22.2 | 28.1 | 21.3 | 21.2 | 22.6 | 17.4 | 21.1 |
| Total..... | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Note: Numbers in parentheses are category numbers of the International Statistical Classification, 1948.

Table 6 shows a percentage distribution of deaths by 12 leading causes for hospital and general populations respectively. In both populations, arteriosclerotic and degenerative heart disease ranked the highest among the 12 leading causes but, in the course of 5 years, the relative importance of heart disease as a cause of death has gradually and significantly decreased in mental hospitals as compared with an opposite trend observed in general communities. This may be partially explained by an increase of the incidence and mortality of vascular lesions affecting the central nervous system among patients, which has actually inflated the proportion by nearly 10 percent during the period covered by this study. While malignant neoplasms rank fourth as a cause of death in the mental hospitals as compared with second in the general population, the crude death rate for this cause among mental patients is greater than that in the general population. Pneumonia, which has become increasingly unimportant as a cause of death in the general population, is still one of the most frequent causes of patient deaths. The concentration of deaths among a few leading causes was much greater

for the hospital population than for general communities.

Table 7 provides the standardized cause-specific death rates per 100,000 of each of the hospital and general populations by sex.

There has been a steady, and general, decline in the importance of tuberculosis as a leading cause of death, although it has consistently maintained a much greater importance in the hospital population. To be specific, the death rate in hospitals dropped from 293.4 to 116.2 in the course of 5 years, while in communities it declined from 27.2 to 11.1. In general, the mortality rate of this disease was considerably higher for men than for women. However, the rate difference between the two sexes was not as distinct in the hospital population as in the general population. Syphilis and its sequelae were relatively unimportant as a cause of death in both populations, but while the rate declined from 10.5 to 2.9 in the general population, there was a rise from 26.9 to 40.4 among the patients during the 5-year period. This is explained by a sharp rise in mortality from this disease in aged patients, particularly among older male patients.

Table 7. Standardized cause-specific death rate per 100,000 for hospital population and general population by sex, 1950-54 average

[Age group under 20 is excluded]

| Cause of death ¹ | Standardized ² death rate | | | | | | Ratio of the hospital death rate to the general death rate by sex | | |
|---|--------------------------------------|-------------------|--------------------------|-------------------------|-------------------|--------------------------|---|------|-------------|
| | Mental hospitals | | | General population | | | | | |
| | Both sexes ³ | Male ⁴ | Fe- male ⁴ | Both sexes ³ | Male ⁴ | Fe- male ⁴ | Both sexes | Male | Fe- male |
| Arteriosclerotic and degen- erative heart disease..... | 895.4 | 1,111.5 | 625.4 | 333.1 | 441.2 | 222.6 | 2.7 | 2.6 | 2.8 |
| Pneumonia..... | 552.2 | 647.6 | 419.9 | 17.6 | 23.9 | 11.4 | 31.4 | 27.1 | 36.8 |
| Vascular lesions..... | 342.4 | 372.6 | 305.2 | 127.9 | 130.5 | 125.4 | 2.7 | 2.9 | 2.4 |
| Tuberculosis..... | 225.2 | 231.4 | 149.4 | 17.3 | 25.1 | 9.2 | 13.0 | 9.2 | 16.2 |
| Malignant neoplasms..... | 148.7 | 171.9 | 144.5 | 188.7 | 197.9 | 181.2 | .8 | .9 | .8 |
| Hypertension..... | 88.5 | 99.2 | 67.5 | 61.6 | 58.1 | 64.6 | 1.4 | 1.7 | 1.0 |
| Nephritis and nephrosis..... | 48.2 | 53.7 | 41.0 | 17.4 | 18.7 | 16.1 | 2.8 | 2.9 | 2.5 |
| Suicide and self-inflicted in- jury..... | 24.7 | 28.2 | 21.5 | 15.0 | 23.6 | 6.4 | 1.6 | 1.2 | 3.3 |
| Accidental..... | 22.1 | 22.2 | 21.8 | 72.7 | 103.9 | 41.3 | .3 | .2 | .5 |
| Cirrhosis of liver..... | 12.2 | 8.1 | 16.8 | 13.5 | 17.3 | 9.6 | .9 | .5 | 1.8 |
| Syphilis..... | 10.0 | 15.2 | 5.1 | 5.1 | 7.6 | 2.6 | 2.0 | 2.0 | 2.0 |
| Diabetes mellitus..... | 5.5 | 4.1 | 6.7 | 27.8 | 21.7 | 34.0 | .2 | .2 | .2 |

¹ See table 6 for full title of cause. ² Michigan 1910 population used as standard. ³ Rates standardized for age and sex. ⁴ Rates standardized for age.

The mortality rate for malignant neoplasms was generally higher in the hospitals than in the general communities, but the difference was not particularly remarkable. For example, the rate differential was 339.1 to 202.0 in 1950 and 368.7 to 222.2 in 1954. It is noted that while more men than women were dying from cancer in the general population during the entire quinquennium, the opposite pattern was developing toward the end of the period in the hospital population where female patients finally exceeded male patients in mortality rates from this disease. This increase in the importance of cancer as a cause of death among female patients seems worth special attention. The death rate for women in the 35-64 age group decreased fairly steadily in general communities, but rose rapidly in the mental hospitals' female population. In the general population there was an extraordinarily high cancer mortality rate for the aged group. It should be noted that the death rate for the general population not only exceeded that for the patient population, but also increased rapidly during the course of 5 years.

Diabetes mellitus is the one cause of death studied which was considerably more prevalent in the general population than inside the hospitals. For instance, the rates were 34.0 and 10.8 respectively in 1950. This difference was clearer and more consistent for the old age group. However, during the period of the study, the hospital death rate from diabetes showed a gradual rise from 10.8 to 35.4 which seems to be indicative of an increasing importance of this disease among mental patients. This increasing trend was almost exclusively accounted for by the female patients, particularly those in the older group.

Vascular lesions affecting the central nervous system caused a high mortality in both populations, although the mental hospitals had much higher rates than the communities, regardless of age and sex differences. During the quinquennium there was a very conspicuous rise in this disease as a cause of death in the hospital population, an increase in the rate from 656.7 to 1,146.4, but the rate remained relatively stable at the level of 150 in general communities.

Arteriosclerotic and degenerative heart disease was the most outstanding cause of death

commonly found in both populations. In 1950 the rate was 2,616.1 in hospitals and 372.1 in the general population. While there was a rising trend of the mortality from heart disease in the general population, there was a consistent and favorable decrease in the mortality from the same disease in the mental hospitals, particularly among female patients. The excess of male mortality over female mortality from heart disease was a common phenomenon. However, this characteristic was found to be much more distinct in the hospital population than in the general population.

Mortality rates from hypertension with and without heart disease were about twice as high in the hospital population as in the general community. For instance, in 1954 the rates were 116.2 and 65.9 respectively. It is notable that in the community population relatively more women than men were dying from hypertension, particularly in the older age group. In mental hospitals, on the other hand, there was a consistent and rapidly growing trend in mortality from hypertension during the first few years of the period.

It has been mentioned previously that the sharpest difference in mortality rates between the two populations was from pneumonia. On the 5-year average the rate difference was indicated by as high a ratio as 20 to well over 1,000. However, there has been a steady decline in the death rate from pneumonia in the hospital mortality tables, while the mortality in the general population has remained relatively stationary. This is probably a reflection of the improvement in the general medical care of patients in mental institutions.

Cirrhosis of liver was one of the much less important causes of death in both populations. In 1954 only 20.2 and 15.1 persons died of this disease in mental hospitals and general communities respectively. It is also indicated that neither environmental differences nor the differences in demographic characteristics seem to produce an appreciable variance in the mortality from this disease.

A steady decline in the death rate from nephritis and nephrosis was experienced both in the general population and in the mental hospitals, but this trend was much more markedly observed in the latter, where the rate changed

from 166.9 to 30.3, than in the former, where it changed only from 22.4 to 16.1.

Suicide and self-inflicted injury was a much more common cause of death in mental hospitals at the beginning of the quinquennium. The actual rate difference was 43.1 to 16.3 in 1950. However, the death rate difference became almost negligible toward the end of the period as the patient deaths from this cause gradually declined. This was almost entirely due to a decrease in suicide among male patients, in which group the death rate actually dropped to less than one-third of the 1950 record. Thus, at the end of the quinquennium, the death rate for men in the general community became considerably higher than that for men in the hospital population. Suicide and self-inflicted injury was a much more prevalent cause of death among people in the productive ages than those in other ages.

The accidental death rate was much lower in the hospital population than in the general population. In 1950, for instance, there were 26.9 per 100,000 accidental deaths in hospitals while 77.1, or three times as many, deaths per 100,000 were caused by accidents outside hospitals. However, there was a general rising trend in the mortality among patients, particularly among female patients.

Standardized Cause-Specific Rates

Having eliminated the influence of age-sex composition of a population, the standardized 5-year average rates provide a better basis for comparison of the mortality from specific causes between hospital and general populations, as well as between men and women of each population. The standardized cause-specific death rates for each of the two populations are ranked in the following order:

Hospital

- | | |
|--|--------------------------------------|
| 1. Arteriosclerotic and degenerative heart disease | 7. Nephritis and nephrosis |
| 2. Pneumonia | 8. Suicide and self-inflicted injury |
| 3. Vascular lesions | 9. Accident |
| 4. Tuberculosis | 10. Cirrhosis of liver |
| 5. Malignant neoplasms | 11. Syphilis |
| 6. Hypertension | 12. Diabetes mellitus |

General

- | | |
|--|---------------------------------------|
| 1. Arteriosclerotic and degenerative heart disease | 7. Pneumonia |
| 2. Malignant neoplasms | 8. Nephritis and nephrosis |
| 3. Vascular lesions | 9. Tuberculosis |
| 4. Accident | 10. Suicide and self-inflicted injury |
| 5. Hypertension | 11. Cirrhosis of liver |
| 6. Diabetes mellitus | 12. Syphilis |

The death rates from two different causes, pneumonia and tuberculosis, showed a marked difference between the two populations. The age-sex adjusted rate from pneumonia was approximately 30 times as high in the hospital as in the general population, while the rate from tuberculosis was 13 times as high in the hospital as in the general population. The adjusted rate from heart disease, vascular lesions, hypertension, nephritis and nephrosis, suicide, and syphilis was about twice as high for the patients as for the people in the community. Conversely, cancer, accident, diabetes mellitus, and cirrhosis of liver were found to be less important among the patients.

The data further indicate that the spread between highest and lowest cause-specific death rates was much smaller for the general population than for the hospital population. The adjusted mortality rates were always higher for men than for women excluding diabetes mellitus in both places, cirrhosis of liver in the hospital, and hypertension in the community.

Rates by Psychiatric Diagnosis

Of somewhat different significance from the cause-specific death rate was the death rate as it relates to psychiatric diagnosis. The diagnosis-specific rate is measured as the number of patient deaths with a given psychiatric diagnosis per 1,000 patients with the same diagnosis. The number and percentage distribution of resident patients and deaths by diagnosis (7) and sex and the diagnosis-specific death rates for 1955 are presented in table 8. (Because of the availability of data, 1955 was used for the data analyzed in table 8. Death rates computed in this table can be treated as proportions amenable to the statistical test for the significance of the difference. However, in view of small numbers in some diagnostic categories, the sampling distribution of the difference between

Table 8. Number and percentage distribution of resident patients and deaths, by diagnosis and sex, and diagnosis-specific death rate, 1955

| Diagnosis by sex | Patients | | Deaths | | Death rate per 1,000 |
|---------------------------------|----------|-----------------------|--------|-----------------------|----------------------|
| | Number | Per-cent ¹ | Number | Per-cent ¹ | |
| <i>Both sexes</i> | | | | | |
| Acute brain disorders..... | 84 | 0.4 | 11 | 0.8 | 131.0 |
| Chronic brain disorders..... | 2,693 | 13.2 | 209 | 14.3 | 77.6 |
| Disorders of the senium..... | 2,253 | 11.1 | 813 | 55.7 | 360.9 |
| Involuntional psychoses..... | 442 | 2.2 | 32 | 2.2 | 72.4 |
| Manic-depressive psychoses..... | 773 | 3.8 | 50 | 3.4 | 64.7 |
| Schizophrenia..... | 11,792 | 57.9 | 252 | 17.3 | 21.4 |
| Psychoneurotic disorders..... | 239 | 1.2 | 11 | .8 | 46.0 |
| Personality disorders..... | 440 | 2.2 | 13 | .9 | 29.5 |
| All others..... | 1,660 | 8.1 | 69 | 4.7 | 41.6 |
| Total..... | 20,376 | 100.0 | 1,460 | 100.0 | 71.7 |
| <i>Male</i> | | | | | |
| Acute brain disorders..... | 65 | .7 | 6 | .7 | 92.3 |
| Chronic brain disorders..... | 1,745 | 17.6 | 118 | 15.6 | 67.6 |
| Disorders of the senium..... | 1,045 | 10.5 | 409 | 54.2 | 391.4 |
| Involuntional psychoses..... | 134 | 1.4 | 19 | 2.5 | 141.8 |
| Manic-depressive psychoses..... | 267 | 2.7 | 17 | 2.3 | 63.7 |
| Schizophrenia..... | 5,404 | 54.5 | 134 | 17.7 | 24.8 |
| Psychoneurotic disorders..... | 101 | 1.0 | 6 | .8 | 59.4 |
| Personality disorders..... | 316 | 3.2 | 8 | 1.1 | 25.3 |
| All others..... | 832 | 8.4 | 38 | 5.0 | 45.7 |
| Total..... | 9,909 | 100.0 | 755 | 100.0 | 76.2 |
| <i>Female</i> | | | | | |
| Acute brain disorders..... | 19 | .2 | 5 | .7 | 263.2 |
| Chronic brain disorders..... | 948 | 9.1 | 91 | 12.9 | 96.0 |
| Disorders of the senium..... | 1,208 | 11.5 | 404 | 57.3 | 334.4 |
| Involuntional psychoses..... | 308 | 2.9 | 13 | 1.8 | 42.2 |
| Manic-depressive psychoses..... | 506 | 4.8 | 33 | 4.7 | 65.2 |
| ----- | 6,388 | 61.0 | 118 | 16.7 | 18.5 |
| ----- | 138 | 1.3 | 5 | .7 | 36.2 |
| Personality disorders..... | 124 | 1.2 | 5 | .7 | 40.3 |
| All others..... | 828 | 7.9 | 31 | 4.4 | 37.4 |
| Total..... | 10,467 | 100.0 | 705 | 100.0 | 67.4 |

¹ Percentages, rounded, may not add to 100.

proportions may not approximate normality.)

Diagnostic groupings in this study were developed to provide homogeneity of categories and also to use the experience in hospitals which has indicated meaningful subgroups. Since the mortality data were not available by age and sex for each diagnosis, the following discussions are based upon the crude death rates without control for the age-sex variation of the patient groups with different diagnoses.

More than 80 percent of the 20,376 patients residing in State mental hospitals in 1955 were included in three diagnostic classes, with 57.9 percent diagnosed as schizophrenic; 13.2 percent diagnosed as chronic brain disorders; and 11.1 percent diagnosed as disorders of the senium. The degree of concentration just mentioned was found to be somewhat higher among male patients than among female patients, although a considerably larger proportion, 61.0 percent, of female patients than of male patients, 54.5 percent, belonged to the schizophrenic group. There were about twice as many males as females with chronic brain disorders.

The pattern of diagnosis-specific death rates appeared to be quite different from that of cause-specific death rates. First, the range between highest and lowest rates by diagnosis was found to be much smaller than that by cause of death. Second, resident patients can easily be dichotomized, in terms of crude death rate, into the high- and the low-risk groups respectively. The high-risk groups for both sexes consisted of those with disorders of the senium and those with acute brain disorders. This was also true when female patients were considered individually, but when male patients were so considered, those with disorders of the senium and those with involuntional psychoses actually constituted the high-risk group. Within the low-risk group the variation of death rate was not great.

The highest death rate, 360.9 per 1,000 was found for the group of patients having a diagnosis commonly associated with advanced age, that is, disorders of the senium. The second highest, 131.0 per 1,000, was for the group with acute brain disorders, but when male patients were considered separately the group with involuntional psychoses ranked second highest,

Table 9. Mean age of resident patients, by diagnosis and sex, 1955

| Diagnosis | Mean age and sex | | |
|---------------------------------|------------------|------|--------|
| | Both sexes | Male | Female |
| Acute brain disorder..... | 56.3 | 56.5 | 55.8 |
| Chronic brain disorder..... | 54.3 | 54.5 | 54.0 |
| Disorders of the senium..... | 75.4 | 73.8 | 76.8 |
| Involuntary psychoses..... | 63.2 | 64.5 | 62.6 |
| Manic-depressive psychoses..... | 62.0 | 62.5 | 61.7 |
| Schizophrenia..... | 49.1 | 48.4 | 49.6 |
| Psychoneurotic disorders..... | 51.4 | 45.2 | 55.8 |
| Personality disorders..... | 44.8 | 44.8 | 44.8 |
| All others..... | 53.8 | 52.4 | 55.3 |
| Total..... | 56.7 | 55.8 | 57.4 |

141.8 per 1,000. For other diagnostic groups used in this analysis the rates were always less than 100 and ranked in the following order: chronic brain disorders, involuntary psychoses, manic-depressive psychoses, psychoneurotic disorders, all others, personality disorders, and schizophrenia. The psychotic group with relatively low death rates were those with the so-called functional disorders without known physical basis. For example, the schizophrenic group had the lowest death rate, 21.4 per 1,000, regardless of sex difference. As against the usual pattern, relatively more female patients than male patients diagnosed as either chronic

brain disorders, manic-depressive psychoses, or personality disorders died in 1955.

Physical Condition, Age, and Diagnosis

While the physical condition of a patient on admission cannot be assumed to remain constant during hospitalization, it still is the best available estimate of the importance of physical explanations for the generally high mortality rate of psychiatric patients. The information is provided by the admitting physician and is classified as "good," "fair," "poor," or "critical."

The mean age of resident patients by diagnosis and sex, and the physical condition of patients on admission by diagnosis, were examined together to account for some of the basic differences in the diagnosis-specific mortality rate (tables 9 and 10). Spearman's rank order correlation (8) between diagnosis-specific death rate and percentage of patients with "good" physical condition on admission substantiates a significant relationship between them ($r_s = -0.900$; $P < 0.001$). That is, the greater the percentage of patients with "good" physical condition the lower the death rate. An extremely high death rate for the senile psychoses was well supported by the fact that not only the mean age of this group was high but also a large proportion of the group had a "subnormal" physical condition on admission

Table 10. Percentage distribution of all admissions and admissions for selected age group, by diagnosis, and percentage distribution of admissions for selected disorder, by patients' physical condition, 1955

| Diagnosis | All ages ¹ | Age group | | | Physical condition | | | | |
|---------------------------------|-----------------------|-----------|-------|-------------|--------------------|------|------|------|----------|
| | | 20-44 | 45-64 | 65 and over | Total ¹ | Good | Fair | Poor | Critical |
| Acute brain disorders..... | 1.8 | 2.3 | 2.2 | 0.5 | 100.0 | 58.4 | 28.6 | 10.4 | 2.6 |
| Chronic brain disorders..... | 10.0 | 7.0 | 18.1 | 6.8 | 100.0 | 29.4 | 47.7 | 18.2 | 4.7 |
| Disorders of the senium..... | 20.4 | .1 | 10.6 | 80.4 | 100.0 | 14.8 | 35.2 | 38.9 | 11.1 |
| Involuntary psychoses..... | 3.7 | .3 | 12.0 | 1.6 | 100.0 | 61.5 | 33.5 | 3.7 | 1.3 |
| Manic-depressive psychoses..... | 4.0 | 2.6 | 7.5 | 3.4 | 100.0 | 53.8 | 40.4 | 5.3 | .5 |
| Schizophrenia..... | 42.2 | 65.2 | 32.8 | 4.5 | 100.0 | 74.5 | 21.4 | 3.6 | .5 |
| Psychoneurotic disorders..... | 4.5 | 5.8 | 4.0 | 1.7 | 100.0 | 70.8 | 25.1 | 4.1 | 0 |
| Personality disorders..... | 11.6 | 14.4 | 11.1 | 1.0 | 100.0 | 75.5 | 22.1 | 2.0 | .4 |
| All other..... | 1.8 | 2.3 | 1.7 | .1 | 100.0 | 71.4 | 19.5 | 7.8 | 1.3 |
| Total..... | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 56.1 | 28.4 | 12.4 | 3.1 |

¹ Including 19 and under.

NOTE: Because of the availability of data, 1955 was used for analysis.

identified as either "fair," "poor," or "critical." For example, 11.1 percent of those with disorders of the senium were identified as "critical" at the time of admission to the hospitals.

In contrast, the lower mortality rates for the schizophrenic group and for the group with personality disorders can be explained by the low mean age of each group and also by "good" physical condition of those patients on admission. The relatively high death rates in the diagnostic categories of acute brain disorders, chronic brain disorders, disorders of the senium, involutional psychoses, and manic-depressive psychoses coincide remarkably with the fact that each of these groups had a relatively high mean age as well as a relatively large proportion with "subnormal" physical condition at the time of admission.

It should be noted that as high as 43.9 percent of all patients admitted to State mental hospitals in 1955 were physically identified as either "fair," "poor," or "critical." This seems to be one of the most significant factors explaining the high mortality rate in mental hospitals as compared with the low mortality rate prevalent in the general communities.

The physical condition of the patient on admission was found to be closely related to the patient's age on admission. That is, the higher the age of the patient group the smaller the proportion having "good" physical condition. Spearman's rank correlation coefficient ($r_s = -0.835$; $0.01 > P > 0.001$) supports this generalization. The patient group between the ages of 20 and 44 at the time of admission had 75.7 percent classified as in "good" physical condition while only 17.3 percent of the patients aged 65 and over at the time of admission were so classified.

Summary and Conclusion

The interpretations and generalizations presented in the present study are based on data collected in Michigan for the 1950-54 period. The following conclusions appear to be of significance.

1. The mental hospital population was over-represented by the middle and old age groups as compared with the State population.

2. The hospital mortality rate was more var-

iable and unstable than the general mortality rate.

3. In terms of crude rate the overall hospital mortality was 6.8 times as high as the overall general mortality.

4. When the rates were adjusted for age and sex, the overall hospital mortality was 3.6 times as high as the overall general mortality.

5. The quinquennial decline in the death rate was much greater in the hospital population than in the general population, thus narrowing the rate discrepancy between the two.

6. The quinquennial decline in the death rate was much greater among older people, particularly among older men, in both populations.

7. The sex difference in death rate was much greater in the hospital population than in the general population.

8. The hospital death rate was always higher than the general death rate in each age-sex specific group.

9. The relative importance of each of the 12 leading causes of death was manifested differently in the two different populations. The two most frequent causes of death in the hospital population were arteriosclerotic and degenerative heart disease and pneumonia, while those in the general population were arteriosclerotic and degenerative heart disease and malignant neoplasms.

10. The age-sex adjusted mortality rates from pneumonia and tuberculosis were approximately 30 times and 13 times as high in the hospital as in the general population respectively.

11. Malignant neoplasms, accidents, cirrhosis of liver, and diabetes mellitus were found to be less important for the hospital population than for the general population.

12. The high mortality group of the patients consisted of those with senile psychoses and those with acute brain disorders.

13. The psychotic group with relatively low death rates were those with functional disorders such as schizophrenia.

14. A statistical analysis substantiated a consistent, positive relationship among death rate, patient age, and the proportion of patients with "subnormal" physical condition on admission to the hospital.

Although the present investigation is largely descriptive in nature, it is hoped that the results

will have not only heuristic value but will also be productive of a series of hypotheses in regard to the dynamics of differential mortality among hospitalized psychiatric patients.

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DOCUMENTATION NOTE

An additional table showing the cause-specific death rate per 100,000 for hospital and general populations, by sex, for the 5 years 1950-54, has been deposited as document No. 5565 with the American Documentation Institute Auxiliary Publications Project, Photoduplication Service, Library of Congress, Washington 25, D. C. A photoprint may be obtained by remitting \$1.25; a 35-mm. microfilm copy by remitting \$1.25. Advance payment is required. Cite document number. Make check or money order payable to Chief, Photoduplication Service, Library of Congress.

Syphilis Serology Courses

Eight laboratory courses will be offered at the Venereal Disease Research Laboratory of the Public Health Service in Chamblee, Ga., September 1958 through May 1959, according to the following schedule:

Serology of syphilis. September 8-19; December 1-12; February 9-20; April 6-17.

Tests for syphilis using treponemal antigens. October 6-17; March 9-20.

Fluorescent antibody techniques in the diagnosis of the venereal diseases. March 23-27.

Control of syphilis serology by the regional laboratory. May 4-15.

The four refresher courses in serology of syphilis will consist of lecture, demonstration, and participation periods covering the most widely used nontreponemal procedures in addition to supplemental methods. Special reference will be made to the latest developments, such as the Kolmer test with Reiter protein antigen, the TPCF test, and the use of a stabilized antigen emulsion in the VDRL tests.

The two courses in the treponemal antigen tests for syphilis are designed for senior staff members. The course in fluorescent antibody

techniques will cover the performance of the fluorescent treponemal antibody test, with instruction in the use of ultraviolet microscope assemblies. Instruction in the identification of *Neisseria gonorrhea* and *Hemophilus ducreyi* will include antibody preparation, fluorescein-labeling, and preservation. The course in control of syphilis serology by the regional laboratory, designed for laboratory directors and senior staff members, includes review of national and statewide serologic evaluation programs, laboratory visits, and field workshop procedures, together with discussion and demonstration of new procedures.

Applications must be approved by a State health officer or State laboratory director, by the medical officer in charge or a Federal agency, or by the organization sponsoring applicants from other countries. Application forms may be obtained from: Director, Venereal Disease Research Laboratory, Venereal Disease Branch, Communicable Disease Center, Public Health Service, P. O. Box 185, Chamblee, Ga.

The Nurse in the U. S. Public Health Service

PHS Publication No. 361. Revised September 1957. 24 pages, plus supplement; illustrated.

The story of career opportunities for both clinical and public health nurses in the various nursing programs of the Public Health Service is brought up to date. The booklet describes the work of nurses in Service hospitals, at the Clinical Center of the National Institutes of Health, in Indian health and international health programs, in field research and investigation, in work with States, and in nursing resources activities.

The two personnel systems of the Service, Civil Service and Commissioned Corps, are explained, and methods of applying for various assignments are outlined. A supplement lists requirements for applicants and other detailed employment information.

Patients in Public Hospitals for the Care of the Mentally Ill, 1956-1957

PHS Publication. Mental Health Statistics. Current Reports Series MHB-H-3. December 1957. 8 pages. 5 cents.

Designed to permit early publication of selected statistics for public mental hospital systems in the United States, this report replaces the publications entitled "Patients in Public Hospitals for the Prolonged Care of the Mentally Ill," formerly published in this series, and "Mental Patient Data for Fiscal Year," previously presented in *Public Health Reports*.

Data from two sources are combined. Statistics for 1956 are based on preliminary tabulations of schedules submitted for the 1956 census of mental patients. Those for 1957 are based on estimates obtained in

a special survey of public mental hospitals conducted shortly after the close of the fiscal year. Selected items of patient movement, number of employees at end of year, and maintenance expenditures are shown for each State, with a separation into "all public hospitals" and "prolonged care" for those States having short-term psychopathic hospitals.

National Library of Medicine

PHS Publication No. 507. Revised February 1958. 18 pages.

Library hours, loan procedures, photographic and reference services, translators, history of medicine division, art section, medical motion picture collection, and publications of the National Library of Medicine are described in this booklet.

Uniform Definitions of Home Accidents

PHS Publication No. 577. 1958. 15 pages. 30 cents.

Designed to provide precise meanings of terms in the home accident field, this manual of definitions should prove useful to all personnel engaged in home accident reporting or home accident prevention programs.

To be listed a term must be pertinent to home accident prevention; it must have a special connotation in home accident prevention or a related field (medicine, statistical analysis, engineering, and so forth); and, it should, if possible, indicate a measurable variable. Certain common terms which are subject to misinterpretation are included, but clearly defined common or nontechnical terms found in the average dictionary are omitted.

The definitions were developed by the Conference on Uniform Defini-

tions of Home Accidents that met in Chicago, April 1957, under the sponsorship of the Public Health Service, the American Public Health Association, and the National Safety Council.

Taking Care of Diabetes

PHS Publication No. 567. 1958. 32 pages; illustrated. 20 cents.

Written especially to help the diabetic person and his family develop a better understanding of the disease and its control, this booklet presents salient facts about the physiology of diabetes and the relation of food, exercise, and insulin to its control.

The patient is shown how he can have a wide variety of foods by using the meal plan suggested by his doctor in conjunction with six food exchange lists. The technique used in administering insulin, how to take proper care of injection equipment, and Benedict's test for urine sugar are described.

Emphasis is given to the importance of recognizing symptoms of insulin reaction and onset of diabetic coma as well as the need for the diabetic patient to take proper care of his feet.

Manual for Nutrition Surveys

Interdepartmental Committee on Nutrition for National Defense. 1957. 160 pages. \$1.50.

Methods for conducting nutrition surveys and appraising the nutritional status of a population are presented in this reference and guide. Although the manual is designed primarily for surveys of military forces, the basic approach and methodology are applicable to civilian populations.

The manual is intended to establish uniform methods in collecting data, to provide a reference to insure maximum coverage of the essential facts, and to serve as a guide for interpretation of dietary, biochemical, and clinical data. It also offers guidelines in defining the duties of

various team members and for training local personnel.

The list of necessary supplies and equipment and the chapter on sampling are applicable equally to a single nutrition survey or a permanent nutrition service.

State Personnel in Official and Voluntary Agencies Concerned With Agricultural Migrants

PHS Publication (unnumbered). 1958. 1½ pages.

Persons in selected official and voluntary agencies in the States who are officially designated to be contacted on questions regarding agricultural migrants are identified. Representatives of State departments of health and education, the Farm Placement Service of the U. S. Department of Labor, and the Migrant Ministry of the Home Missions Division of the National Council of Churches are listed along with persons named by the governors as liaison with the President's Committee on Migratory Labor in States where there is no official committee.

Copies can be obtained from: Division of General Health Services, Bureau of State Services, Public Health Service, Washington 25, D. C.

Public Exposure to Ionizing Radiations

What Public Health Personnel Need to Know

American Public Health Association. 1958. 55 pages; glossary. \$1.35; orders for 25 or more at a discount.

This pamphlet aims to provide public health employees with simple concepts basic to a radiological health program. The text presents the issues, in perspective. Although it does not deal with physics or with the precise definition or measurement of radiations, it describes the phenomena of radiations and their probable public health effects. Major sources of radiation of concern to public health workers are discussed

as to their benefits and hazards, present and future.

The pamphlet was prepared by a committee of the American Public Health Association with advice and technical assistance from employees of the Public Health Service. Orders should be placed with the American Public Health Association, 1790 Broadway, New York 19, N. Y.

Research and Education in Rheumatic Diseases

Transactions of the Second National Conference

Arthritis and Rheumatism Foundation and the National Institute of Arthritis and Metabolic Diseases of the Public Health Service. 1957. 156 pages.

Texts of papers presented at the conference are assembled in this book under three headings: basic disciplines and promising pathways in research in rheumatic diseases, support currently available for research and training in rheumatic diseases, and the United States Public Health Service graduate training program in arthritis.

Distribution of the publication, now completed, is limited to members of the participating associations, medical libraries, medical schools, and a selected list of rheumatologists. Inquiries concerning availability should be addressed to the Information Office, National Institute of Arthritis and Metabolic Diseases, Public Health Service, Bethesda 14, Md.

Health Statistics From the U. S. National Health Survey

Origin and Program

PHS Publication No. 584-A1. 1958. 36 pages. 30 cents.

Background information on the U. S. National Health Survey, including history, need for health statistics, policies, and program, is presented in this booklet. It is the first

of a series (series A) covering technical and methodological matters relating to the survey.

Appendices contain the text of the National Health Survey Act (Public Law 652, 84th Congress) and a reprint of recommendations for collection of health data of a subcommittee of the U. S. National Committee on Vital and Health Statistics (PHS Publication No. 333, 1953).

Health Statistics From the U. S. National Health Survey

Preliminary Report on Number of Persons Injured, United States, July-December 1957

PHS Publication No. 584-B3. 1958. 32 pages. 30 cents.

Persons sustaining injuries that caused restriction of their usual activities for at least a day or who were medically attended are included in the estimates. The report contains 26 detailed tables, text tables, and charts presenting breakdowns by age, sex, urban-rural residence, and class of accident. Data are based on nationwide household interviews of a representative sample of the population.

Appendices provide technical notes on methods and definitions.

Digest of Prepaid Dental Care Plans, 1958

PHS Publication No. 585. 1958. By Walter J. Pelton and Richard W. Bowman. 41 pages.

All known prepaid dental care plans operating in the United States are listed by name, with address, sponsorship, date established, geographic area served, eligibility requirements, and size of enrollment. Information on methods of operation and types of benefits offered is also included.

The plans are grouped into two major categories, plans with regular benefits and those with limited benefits, and are subdivided into four groups: communitywide, union spon-

sorship, employer-employee sponsorship, and fraternal organization sponsorship. The complete dental fee schedules of four of the most comprehensive plans are reproduced in the appendix.

Tuberculosis Beds in Hospitals and Sanatoria, May 1, 1957

PHS Publication No. 518. 1958. By Stanley Glaser and Josephine Johnston. 41 pages. 30 cents.

A listing by State and city, as well as alphabetically, of hospitals and sanatoria in the United States and Territories with five or more beds available for treating patients with tuberculosis is provided. Included are all State, local, private, and Federal institutions except Federal mental and penal institutions. Type of ownership is specified.

Homemaker and Related Services

A Directory of Agencies in the United States

PHS Publication No. 598. 1958. 75 pages.

Name, location, telephone number, type of agency, area served, kind of service provided, year established, number of homemakers employed, and number of families served during a 1-week period are listed.

The directory was compiled from a nationwide survey of homemaker services by the Public Health Service in cooperation with the Children's Bureau and the Bureau of Public Assistance, Social Security Administration.

Strike Back at Stroke

PHS Publication No. 596. 1958. 37 pages; illustrated. 40 cents.

Step-by-step instructions and illustrations are given for 21 therapeutic exercises developed by experts in the field of medical rehabilitative therapy. The booklet also

contains information on how to fix the bed for the patient, how to place the patient in bed, and what to do if the patient cannot speak.

Designed to make it easier for the doctor to show what can be done for and by the stroke victim at home to help minimize the disability that usually follows a stroke, the manual even contains a prescription blank printed below each exercise so that the doctor can specify the frequency and duration of selected exercises.

The Vending of Food and Beverages

PHS Publication No. 546. 1957. 18 pages. 15 cents.

Intended for adoption by municipalities and States, the suggested sanitation ordinance and code contains the recommendations of the Public Health Service. It is published for the guidance of jurisdictions desiring a uniform law based on the best information currently available. The format of the ordinance permits flexibility in adoption or enactment.

The recommendations are based on field studies of current practices in vending machine design, construction, and operation, and a review of existing State and local regulations. They were developed at the request of State and local health authorities and the vending machine industry.

Proceedings of Symposium on Coccidioidomycosis, 1957

PHS Publication No. 575. 1957. 197 pages; illustrated.

Currently available information on the epidemiology, ecology, immunology, pathology, diagnosis, and treatment of coccidioidomycosis, together with the most recent advances in research, is comprehensively reviewed. This material is published for the benefit of investigators everywhere who are attempting to overcome the difficulties in diagnosing, controlling, and treating this disease.

Directory of Medical and Biological Research Institutes of the U. S. S. R.

PHS Publication No. 587. 1958. 340 pages.

More than 700 biological and medical research institutes in the U. S. S. R., with their subdivisions and laboratories, are listed in this directory. Arrangement is geographic, with a subject index. A name index includes more than 1,500 Russian scientists.

The directory is intended as a guide not only for those planning scientific visits or correspondence but also for those studying Soviet medical research.

Extent of Cancer Illness in the United States

PHS Publication No. 547. 1958. 23 pages. 25 cents.

Trends and variation in cancer mortality and incidence, some aspects of diagnosis and treatment, and survival prospects for cancer patients are covered in this well-documented, statistical study of cancer. The booklet is comprised of 31 questions and answers together with 22 charts and 9 tables. It is directed to persons concerned with the course of cancer in individual patients or with its impact on larger population groups.

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared by other Federal agencies.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications other than its own.

the Hospital

as a Community Health Center

EDWIN L. CROSBY, M.D., Dr.P.H.

Following is the Wilinsky Lecture, delivered at the Harvard School of Public Health, Boston, on October 14, 1957. The Charles F. Wilinsky Lecture Fund was established in 1954 to endow lectures on the role of the hospital in public health. Dr. Wilinsky served as executive director of Beth Israel Hospital in Boston and deputy health commissioner of that city. He is a former president of both the American Public Health Association and the American Hospital Association.

THE HOSPITAL is a dynamic, not a static, institution. Looking at our hospitals in the context of American life and medical and scientific progress, we know that a revolution in hospital care is under way. In the words of Dr. James Mackintosh, emeritus professor of public health, School of Tropical Hygiene and Public Health, University of London, "It is exciting to live in a revolution; it is tragic not to realize it."

A little more than a half century ago it seemed that we'd gone about as far as we could. Then science exploded into medicine and almost overnight there was a whole galaxy of new treatment techniques, new equipment, and

Dr. Crosby is the director and a former president of the American Hospital Association. He served as director of Johns Hopkins Hospital, Baltimore, Md., from 1945 to 1952, and as director of the Joint Commission on Accreditation of Hospitals from 1952 to 1954. In 1950 he was the United States representative on the Expert Subcommittee on Hospital Statistics of the World Health Organization.

new and different personnel. Even professional workers in the health field must be astounded by the many new scientific developments which have changed hospital and health care in the last two generations. This period has been marked by the development of roentgenology; advances in the science of nutrition, including the discovery of vitamins; elimination of most of the infectious diseases through immunization, better control, and good public health practice; the control of diabetes with insulin; the discovery of the antibiotics; the medical use of radionuclides; new anesthetics making possible amazing surgical procedures; the use of human blood and its fractions; and so many other giant feats that I cannot possibly mention them all. During this period, medical thought broadened to see the individual as a physical and emotional whole. As Francis Peabody said, "What is spoken of as a clinical picture is not just a photograph of a man in bed; it is an impressionistic painting of the patient surrounded by his home, his work, his relations, his joys, sorrows, hopes and fears" (1).

In addition to the effect of new techniques in health care, hospitals have also felt the impact of dramatic social and economic developments in the United States. Our population is growing; we are now a nation of some 170 million, and by 1967 if the present rate of increase continues, we may well have a population of almost 200 million. There is a continuing increase in the proportions in our population of the elderly and of the very young, although we

are often inclined to overlook the proportionate increase of the very young.

Through our fine educational system, through the various medical, hospital, and public health organizations, and through the work of public information media, this vast American public is growing in knowledge about health services and becoming increasingly appreciative of the value of health. Good health care has become part of the increasingly higher standard of living which more Americans can now afford. The improving economic conditions of the last two decades have been accompanied by new concepts of the responsibility of employers, unions, and government at all levels for maintaining health.

As a result of this growth in numbers and in understanding of health care, the utilization of hospitals has risen rapidly. From 1946 to 1956 the number of admissions to all hospitals increased 41 percent, and admissions to nonprofit, short-term hospitals, the community hospitals, increased 54 percent. This increased use of hospitals is not due solely to increased population. In 1946, there were 112 admissions per 1,000 population to all hospitals, and in 1956 there were 132 admissions per 1,000 (2).

Meanwhile, the financial problems of hospitals have changed too. The costs of new buildings and of renovating old hospital facilities have been rising. Voluntary hospitals are no longer simply philanthropic institutions supported by private donations. Hospitals today are dependent on fees from patients or third parties such as Blue Cross, insurance companies, and public welfare agencies. Increased costs of operation have forced them to become business organizations. They are concerned with balancing budgets and defining the full cost of services in order to collect from the patient, or in his behalf, the amounts necessary to sustain the hospital's operations.

Thanks to the growth of prepayment, the hospital as an economic organism is now more stable than ever before. But the public has yet to fully realize the dollar cost of health care. People want the best in health care. It must be paid for, in one way or another. Hospital and other workers in the health field must support the idea that people should set aside enough from their current income to enable them to pay

for the best of care. We are responsible for seeing that they get a full dollar's worth of care for every dollar spent.

We in hospital careers feel the impact of revolutionary medical and social advances, and we are doing our best not only to adapt to them but also to advance hospital care as rapidly as possible.

Hospitals and Public Health

I would like to discuss one important aspect of hospital care, the hospital as a community health center. The community's investment in the hospital can best be realized when hospitals and public health authorities work together with the medical profession as partners in the teaching and practice of preventive medicine and public health. The relationship between the hospital and the public health profession has been, and continues to be, an important area for study, discussion, and action.

However, I would like to consider the hospital's contribution to the health of the public in a wider context; to describe some ways in which the hospital may serve its community; and finally, to discuss ways in which the public, through the hospital, may help improve the public health.

For many years, the hospital was virtually an island of curative medicine. To be sure, many hospitals thus insulated did a remarkably good job of serving their communities. But just as the practitioner of medicine can no longer limit his tools to his black bag, the average hospital today cannot offer the best care while limiting its resources to the skills found within its walls. If the hospital lives as an island in the community, concerned only with the patients who pass through its doors, not thinking whence they come or where they go, it is an incomplete public servant; it does not fully meet public demands.

I have heard Dr. Mackintosh say that while the function of hospitals today is "to care for the sick, in the future their function will be not to care for the sick, but rather the well." He emphasizes, and I agree with him, that its public health responsibility is one of the major functions of the hospital. In his words, "The good hospital acts as an intelligence service

sending out, as necessary, danger warnings for the protection of the public. Its function is to watch the movement of sickness, to act early and with dispatch before great harm is done. . . . Sickness is an incident in the life of an individual, but to the hospital and its staff, sickness is a challenge, a focus of enquiry from which prevention should radiate as well as cure." As early as 1936, the Committee on Public Health Relations of the American Hospital Association, of which Dr. Wilinsky was chairman, stated that newer conceptions of an adequate community health program emphasize "the gradual disappearance of the line of demarcation between the prevention and the treatment of disease" (3).

In fact, preventive medicine has long been a joint responsibility of the hospital and health departments. The hospital assists the work of the health department by deeds such as registering births and deaths; detecting and reporting communicable diseases; treating patients with tuberculosis and poliomyelitis; and continuing the never-ending fight against infection, a fight recently dramatized by the appearance of resistant strains of *Staphylococcus aureus*. The health department, especially in rural areas, may use the laboratory and other clinical facilities of the hospital. The hospital practices the principles of maternal, infant, and child hygiene, and tries to educate the patient and his family in these and other matters of health and hygiene.

The Ford Foundation reports that many hospitals used part of their foundation grant to improve educational facilities for the communities they serve; that they organized educational programs on such aspects of preventive medicine as maternal and child care, sex education, nutrition, mental hygiene, and early detection of serious diseases; and that their social service and outpatient departments "combine treatment with instruction in solving family health problems" (4). In the outpatient work of the hospital, cooperation between the health department and the hospital is closest. As the patient leaves the hospital, he is followed by the health department, which sees that the hospital's achievements are not lost and that he is restored to the greatest possible self-reliance.

Hospitals are also working out other new programs to extend their services to their communities. Individual hospitals and hospital associations are undertaking research in management aimed at expanding the hospital's responsibilities in community health protection. Subjects of such studies have included the planning of the hospital's physical plant, the improvement of food service, the possibility of organizing regional cooperation between large and small hospitals, and the development of new programs of outpatient and home care.

In another expansion of their service to their communities, hospitals are extending their emergency responsibilities beyond that of routine service in disaster planning: the resourceful organization of emergency equipment and procedures to save lives when natural or mechanical catastrophes engulf numbers of people. To be ready for communitywide emergency situations—whether fire, flood, tornado, or train or plane crash—hospitals are cooperating in planning with public health, civil defense, and other community agencies.

Another hospital activity, no longer new but of the utmost importance, is the voluntary program of hospital accreditation. Accreditation means that the quality of patient care in the hospital meets adequate standards. It is a stamp of approval conferred by the Joint Commission on Accreditation of Hospitals, an independent group formed in 1952. The public is becoming aware of the distinction between accredited and nonaccredited hospitals; the hospital which requests a survey and achieves accredited status, or is earnestly working toward that goal, vouches to the community that it is serving its best interests. Accreditation is a voluntary program of continued self-inspection, the strongest arm of freedom of medicine and hospitals. Through accreditation, hospitals indicate to their communities that with independence in a free society goes the responsibility to measure up to society's demands. National recognition that hospitals are striving to improve their services is indicated by the recent Ford Foundation grant to establish voluntary counseling service to help hospitals improve their administrative services and, as a result, their patient care.

Extending Services

Four aspects of extending the hospitals' services into the community seem to me especially adventurous and important: planned cooperation between large and small hospitals, new rehabilitation programs, new types of care for the chronically ill, and new concepts of outpatient care.

We still need more precise definition of the elements of institutional care of the sick. Such definition would lead to more effective and economical care. The community hospital of the future will not stand alone, but must be linked in some organized way with other institutions. With such a link difficult problems can easily be referred to centers with more specialized facilities, and the staffs of outlying institutions can benefit regularly by visits from specialists from the more central and highly developed hospitals. Every community should have a carefully developed plan for orderly integration between health and welfare agencies and the various institutions offering health services.

I would make three suggestions to guide planning. First, the community plan must assure that each patient is treated in the type of institution that his condition requires. Second, we must organize professional disciplines and physical equipment to focus on special treatment problems, grouping patients according to need and where care can best be given. Third, patient transfer is a two-way street. We must move toward broader acceptance of transfer of patients from small hospitals to large medical centers as patient care dictates. And conversely, we must arrange for movement of patients from general hospitals to nursing homes, convalescent homes, or home care programs.

Rehabilitation, the second important aspect, is vital in the changing therapeutic picture. I have often thought that almost every patient who enters a hospital is in need of some kind of rehabilitation, whether a brief but encouraging chat, a mild form of special exercise, or, in more seriously disabled cases, intensive physiotherapy and psychotherapy. All members of the hospital staff will need to understand the importance of rehabilitation in the early stages of a patient's illness.

I believe that if we are to bring the benefits of rehabilitation services to communities—including the smaller ones—then the hope for establishing and developing such services rests with the community hospital. A centrally located rehabilitation center may be able to serve the patients of several hospitals in the area. These centers might have not only medical and directly allied facilities but also such services as vocational testing, guidance, and training.

Many hospitals now include rehabilitation among their services, but as Dr. Theodore Khmmpf has pointed out, "The hospital is still only a repair shop where broken bodies are sent to be mended" (5). I would agree with him that some day it will also be a maintenance shop where the most intricate mechanism in the world will be sent to find out how it can best be cared for to prevent damage. The development of proper rehabilitation services in a community is one of the greatest challenges facing hospitals.

Problems relating to the illnesses that accompany middle and later life are a third growing concern in the health field. In fact, meeting the challenge offered by our increasing number of aging persons is probably the single greatest problem we face. George Bugbee, president of the Health Information Foundation, has reported that the group over 65 incurs 13.1 percent of all charges for health services although it constitutes only 8.4 percent of the population (6). And the problem will become greater. Today, more than 13 million people are 65 years of age or older, and by 1980, 1 out of every 7 people will be 65 or older, while 2 out of 5 will be 45 or older.

Because much of the illness that hospitals see will be chronic, hospitalization will generally be a relatively short episode in a long course of treatment, and care will have to be continued at home. In the future services provided at home cannot be limited, as they generally have been in the past, to those performed by doctors and nurses. The full range of services now provided only to the hospital inpatient must be properly adapted to home care.

New concepts of outpatient care open a fourth area of expanding hospital service. Along with the other revolutionary trends in hospital care will come the death of the old idea that ambulatory care is only for the poor. Very slowly,

forced by a combination of economics, science, and good old-fashioned common sense, we are accepting the idea of ambulatory service to the whole community. Community hospitals take bed patients of all income groups, and in the future hospitals will probably eliminate financial distinctions among ambulatory patients as well. For both ambulatory and bed patients, it is becoming clearer that prepayment will be the means of paying hospital bills for the self-supporting, while tax funds assist the medically indigent and cover the cost for the indigent.

A major fault in our organizational plans for the care of ill persons has been that the plans seem to encourage patients to lie down in hospital beds in order to be eligible for prepayment benefits. Without the benefit of prepayment it is only natural for people to delay seeking the care they need. In the interest of good community health we must encourage prepayment plans to offer more complete coverage, adding to basic inpatient coverage on a service benefit basis both extended benefits and protection for the ambulatory patient.

Need for Research

In considering regional cooperation, outpatient care, and other new demands upon the hospital, I am repeatedly impressed with the problems of hospital administration and with the urgent need for hospitals to expand research into all phases of their operation. Hospital administration is being recognized as the demanding science and art that it is. With its singular system of relationships among the trustees, medical staff, administrator, other personnel, and volunteers, the hospital, of all institutions that I know, is the most difficult to administer. It is also one of the most satisfying. If the administrator is a skillful manager, he can help the complex health team work better together in the interest of the patients and their community. I predict that hospitals will become even more complex institutions to administer in the years to come. Two reasons for this prediction can be summed up in two words: costs and personnel.

The cost of hospital care has been rising, and there is no denying that it will continue to rise. A well-reasoned but admittedly conservative

estimate made in 1954 was an increase at the rate of 5 percent per year (7). From 1955 to 1956, the increase was 9 percent (2). Providing facilities and personnel for a widening range of services grows more expensive every year. The total expense of the Nation's short-term, non-profit, general hospitals rose 223 percent from 1946 to 1956. Better patient care today means both more skilled personnel to provide new technical services and simply more personnel of all types. In nonprofit, short-term hospitals, our community hospitals, personnel increased from 156 per 100 patients in 1946 to 213 per 100 patients in 1956 (2). No wonder payroll expense eats the largest chunk from the hospital's budget, more than 60 percent of the total expense of nonprofit, short-term, general hospitals in 1956.

At the same time that the number of personnel has been increasing, the number of hours in the workweek of hospital personnel, like those in offices and factories, has been decreasing. The difference is that the hospital must operate 24 hours a day, 168 hours a week, 52 weeks a year, always ready for any emergency. The shorter workweek has frequently been helpful in attracting additional qualified personnel, but because of the around-the-clock nature of the hospital's activities, it has also necessitated many more workers, a larger payroll, higher costs, and inevitably higher charges.

As hospitals convert the results of medical research into ever more comprehensive patient care, they may reasonably expect that the percentage of the hospital budget allotted to payroll will rise to more than 70 percent. As wages rise generally, they must rise in hospitals. Hospital administrators in virtually every community face an acute and seemingly chronic shortage of personnel. Hospital careers offer well-recognized satisfactions of service, association with the aura of medical learning, and the prestige of the uniform of healing. But recruitment will not be easier until hospitals can compete with other employers' wages. Hospitals must make sure that they use their staff wisely and do not waste talent and training.

Automation can never be the complete answer for personal service institutions; reducing costs by increasing productivity is far more difficult in hospitals than in industry.

Yet I am optimistic enough to think that studies will show us how automation can be exploited more fully, for example, in food service, laundry, central supply, and other such departments. Through improved methods and work simplification, hospitals will undoubtedly be able to increase the efficient use of workers' time. We must stop viewing with alarm the rising costs of hospital care, but we must not cease our efforts to keep costs down to the minimum consistent with maximum quality. Hospitals must demonstrate to the public that they recognize the need for economical operation in line with sound business procedures.

Solutions to the problems created by rising costs and shortages of personnel as well as the radical changes in the patterns of patient care will be worked out through research by hospitals' administrative staffs, by all members of the health team, and by social scientists. We often think of research in terms of new drugs, new surgical techniques, and other giant steps in the march of medicine. There is other research that is conducted with as much sincerity of purpose and with results as directly related to patient care. After all, it is the hospital with its laboratories, clinics, and operating facilities that makes it possible for the physician to practice modern medicine.

Until lately research in hospital administration was sparse. We have finally been able to get underway, through foundation and Hill-Burton funds, the organized program of hospital research which we have desired for so long. The American Hospital Association has strenuously urged increased recognition of the importance of research. It was instrumental in setting up two important national research groups. One, the Commission on Hospital Care, offered the first analysis of the extent to which the Nation's health resources were meeting the increased demand for health services (8). The commission's report prescribed a much-needed pattern for orderly planning of health facilities, a pattern which influenced the development of the very successful Hill-Burton program.

The second, the Commission on Financing of Hospital Care, did the first comprehensive analysis of the basic problems in financing hospital care for the American people (9). The

American Hospital Association also participated in the Commission on Chronic Illness, which has completed a 7-year study of the problems of chronic disease, illness, and disability (10).

The Association led in the establishment of the Hospital Research and Educational Trust, a nonprofit, citizen-directed body to undertake needed research in hospital affairs. The trust has, from several sources, about \$4.3 million programed in current research or pledged for future research. It is conducting studies of medical records, hospital licensure, need for future hospital facilities, and construction and design.

I would certainly predict that in the years to come hospitals of all sizes and types will become more active in conducting research. For too long we have thought research could be undertaken only in large medical centers. Actually, all hospitals can keep the accurate records which offer a basis for investigations to determine such things as the relation of social factors to disease and a community's actual and potential needs for various health services. All hospitals can undertake studies designed to evaluate and improve their administration. If we stop labeling these activities with the bogeyword "research," perhaps we can encourage acceptance of the fact that they can be undertaken outside university citadels of learning.

You may have noticed that in speaking of these research programs and the extension of hospital services to which they lead—in describing to you the ways in which today's hospital is living up to its responsibilities as a community health center—my point of view has been rather one-sided; I have been dwelling on the functions of the community it serves.

Adequate preventive as well as curative health care has become an accepted part of the high standard of living which most Americans are now able to attain. The potential consumers of medical care have a right to help plan for community health, and they are becoming more vocal in their desire to do so. I believe that health care can be no better than the people demand. I believe that the people should be as concerned as professional health personnel with the form and the cost of medical care, and the method of paying for it. In the

United States we are fortunate that we have an interested and aroused public, which, if it does not understand all the technical details of our work, understands a great deal more than we frequently give it credit for; and recognizes the importance of health care.

Our community hospitals are built by voluntary contributions from private citizens. Some 115 million Americans are identified with hospitals even before they set foot in one, either through Blue Cross or one of the many commercial insurance plans. The hospital cannot refuse to respond to the demands which the public need places on it. The community in turn must support its hospital. Support it with money, yes, and with a supply of personnel; but above all with a vivid understanding of the hospital's purpose and encouragement of the professional hospital team.

Lay Leadership

In trying to assess the hospital in the rapidly changing community health picture, I find one constant of great importance, a constant unique to the United States. Our community hospitals are truly governed, not by a professionally trained group, but by laymen, community leaders, who are better known for other personal achievements, but who have demonstrated an abiding interest in the community's welfare. Of course, our hospitals are not unique in this regard. Professional educators do not generally govern universities; military men do not establish final policy in the Department of Defense; and nuclear physicists do not speak the last word in the Atomic Energy Commission's decisions on the uses of atomic energy—or space satellites. Major institutions other than hospitals are governed by boards of so-called "lay" trustees. Yet the most highly developed forms of contributed service in our society are those centered in our hospitals, with their trustees, their volunteers, and their members of the religious orders. The story of the founding of every voluntary hospital in America always has a basic theme, contributed service.

The hospital trustees of the Nation—some 50,000 of them—are entrusted with the responsibility of setting policy in medical institutions where only the most expertly trained physicians and paramedical workers can translate the latest

in scientific developments into the best of patient care. The point to remember is the desirability of this arrangement. The lay control of hospitals insures that the community's interest will never be overlooked.

Of course, hospital trustees and volunteers must be particularly sensitive to the hospital's purpose and needs. Theirs must be educated awareness, including a recognition of the need for good equipment and well-trained personnel, an understanding of the problems of the physician and his co-workers, and an effort to facilitate their dedicated labors. As professional health workers, we all have an obligation to educate our communities about the goals and means of health care.

The modern hospital has evolved, not step by orderly step, but by a series of rapid mutations which have not yet stopped. Advances in medicine and changing social and economic conditions are making new demands on the hospital. Its functions of caring for patients, educating future health workers, and serving as a medical research center reach outside its walls into the community. The American public is learning to demand more extensive health services. If the hospital is to maintain its place in the public esteem, it must be prepared to adapt to this demand.

Voluntary hospitals demonstrate how consumers of health services can be effective partners with the producers of these services. Such partnerships have obvious advantages and are bulwarks of strength to our free society. The degree to which the relationship succeeds in a hospital is a major factor in determining the quality of patient care, preventive medicine, and educational and research activities.

I believe that our voluntary hospital system, directed by lay leadership representative of the community, will continue to serve the people to the extent that the public desires service. In the voluntary hospital, the full partnership of an enlightened public, a learned and inspired medical profession, and a dedicated hospital administration represents an opportunity to offer the very best in health care. The American hospital was created out of the pattern of American democracy. It serves in a great tradition, and in the years ahead it will assume an even greater place as a community health center.

As an institution, it has done much and yet has much to do. It needn't be apologetic. It cannot be complacent. Its accomplishments and its challenges are succinctly stated in the Passavant motto: "More than yesterday. Less than tomorrow."

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Water Pollution Control



Continued pollution of stream by municipality's sewage system after decree enjoining pollution constitutes civil contempt of court by municipality and criminal contempt by individual officials failing to take necessary steps to abate pollution, *In re Borough of West Wildwood et al.*, 42 N. J. Super. 282, 126 A. 2d 233 (1956).

The Borough of West Wildwood was directed by a chancery court in 1934 to comply with an order of the New Jersey State Department of Health to desist and refrain from allowing its improperly treated sewage to flow into Post Creek or to correct the inadequacy by a specific date. Four times over a period of 20 years the borough was found guilty of contempt of this order. The first contempt was punished by a fine of \$50 against each city councilman and \$250 against the borough.

The second finding of contempt was followed by the borough agreeing to make the necessary corrections in the sewage treatment plant. After the third finding of contempt, the borough was directed to raise the necessary monies to complete the correction of the sewage treatment plant.

Upon the failure of the borough to comply with this direction, the court in January 1955 levied a fine of \$5000 against the borough, in addition to a fine of \$25 per day until it com-

plied with the order and \$500 against each councilman-defendant who voted "no" or refrained from voting on the borough ordinance providing for correction and installation of new sanitary sewage disposal facilities and authorizing issuance of bonds to help finance such construction.

On application for remission of fines the court remitted the fine levied against the borough upon condition that it be used for the amortization of some portion of its bonded indebtedness. The fines levied against the mayor and councilmen, which were imposed for criminal contempt, were held to be beyond the power of the court to remit after the expiration of 60 days from the date of judgment.

For cases involving a similar situation see *Department of Health of State of New Jersey v. Borough of Fort Lee*, 108 N. J. Eq. 139, 154 A. 319 (1931), and *In re Borough of Fort Lee*, 108 N. J. Eq. 425, 155 A. 473 (1931).

Presently evident trends in death rates from leukemia offer no support for a theory that leukemogenic factors in the American environment have increased sharply within the last 15 years.

Trends of Mortality From Leukemia in the United States, 1921-55

ALEXANDER G. GILLIAM, M.D., and WILLIAM A. WALTER, M.D.

SOME of the deficiencies in the basic data available in the United States for studying the trend since 1921 of deaths attributed to leukemia have been cited by Sacks and Seeman (1). These limitations particularly involve the lack of comparability in the rubrics provided for leukemia in the several revisions of the International Lists of Causes of Death. Prior to the introduction of the fifth revision of these lists in this country in 1939, deaths charged to aleukemia were included with Hodgkin's disease. For this reason, in describing trends from 1921 to 1942, Sacks and Seeman only tabulated the "true leukemias." Cooke (2), however, has pointed out that in 1940 only 4.8 percent of all leukemia deaths were charged to aleukemia. These deaths yielded a crude aleukemia death rate of only 0.2 per 100,000, which should have little effect on trends whether included or not.

An additional difficulty with data for the United States, which is generally overlooked, is that all States were not included in the death registration area until 1933. In 1921 the registration States comprised only 58 percent of the land area of the country and less than 82 percent of the population. In 10 of the 14 States added to the death registration area since 1921,

the standardized leukemia mortality ratios in 1949-55 were lower than the average for the United States (A. G. Gilliam and W. A. Walter, unpublished data). The effect of this changing composition of the death registration States on the trends of leukemia mortality cannot be determined. Beginning in 1933, however, the data available and presented here refer to the entire United States, and beginning in 1939 include those deaths charged to aleukemia.

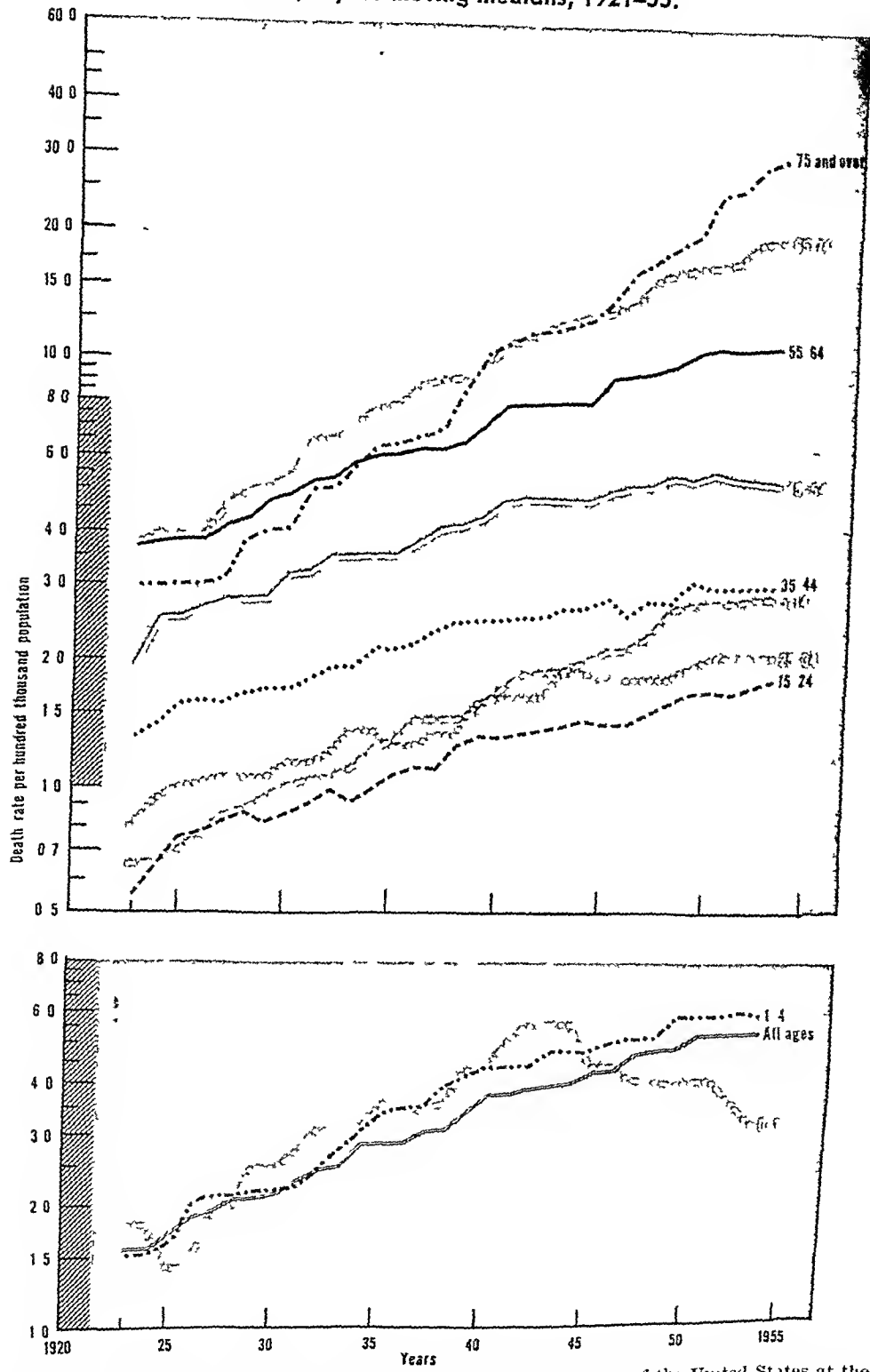
Sacks and Seeman, and Cooke, too, have pointed out that, while there has been a continuous increase in mortality from leukemia, the greatest increase has been in the older ages. In addition, Cooke has noted that in the age groups 0-4 and 0-14 the rate of increase was less between 1940 and 1949 than was observed in the previous 10 years.

To extend the observations of these authors, age-specific mortality rates for each race and sex were computed for each year 1921-55, for the registration States. The age-specific rates derived for white males and females are shown in figures 1 and 2. To achieve some degree of smoothing of annual variation, 5-year moving medians are plotted in figures 1 and 2 rather than the actual annual rates. Furthermore they are charted on a semilogarithmic scale so that changes in rate of increase may be visually evident.

With regard to the age-adjusted rates of leukemia mortality for both males and females of

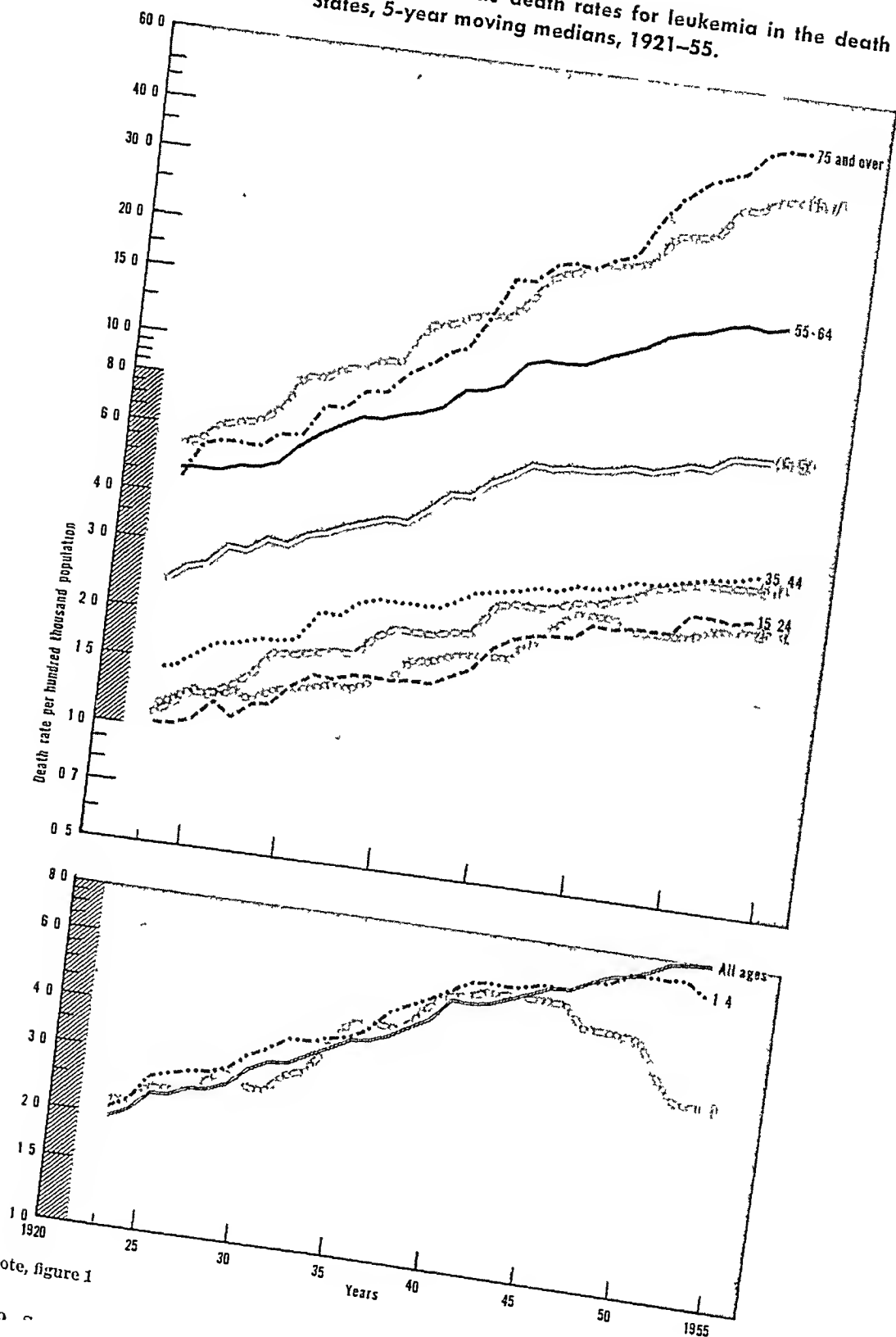
Dr. Gilliam and Dr. Walter are epidemiologists with the Field Investigations and Demonstration Branch, National Cancer Institute, National Institutes of Health, Public Health Service.

Figure 1. White females: trends of age-specific death rates for leukemia in the death registration States, 5-year moving medians, 1921-55.



NOTE. Rates for all ages adjusted to the age distribution of the population of the United States at the 1950 census. International List numbers included are 65a, 1921-29, 72a, 1930-38, 71a,b, 1939-48, and 204, 1949-55.

Figure 2. White males: trends of age-specific death rates for leukemia in the death registration States, 5-year moving medians, 1921-55.



NOTE: See note, figure 1

all ages, there would appear to be no change in rate of increase in the few years before and after 1933, the year in which all States were finally admitted to the death registration area. Beginning about 1940, however, there is a definite decline in the rate of increase, which would appear to be more pronounced among females than among males.

When trends for individual age groups are examined it is observed that there has been a substantial decline in leukemia death rates for both males and females under 1 year of age

since about 1940. In all other age classes, with the exception of those of 75 years or older, the rates have been increasing but the magnitude of increase has been declining. The decline in rate of increase, which is very evident in the younger ages, tends to be progressively less pronounced with advance in age. For those 75 years and older there is no discernible change in rate of increase.

In addition to this decline in rate of increase, there appears to be a tendency since 1950 for actual leveling off of rates in several age

Table 1. Average annual leukemia death rates among white males and females for seven 5-year periods, 1921-55, and annual percentage change in rates ¹

| Years | Age groups (years) | | | | | | | | | | |
|---------------------------------------|--------------------|------|------|-------|-------|-------|-------|-------|-------|-------|-----------------------|
| | 0-1 | 1-4 | 5-14 | 15-24 | 25-34 | 35-44 | 45-54 | 55-64 | 65-74 | 75+ | All ages ² |
| Average annual death rate per million | | | | | | | | | | | |
| Male | | | | | | | | | | | |
| 1921-25 | 21.6 | 23.0 | 10.8 | 10.2 | 11.4 | 14.0 | 23.8 | 46.6 | 52.4 | 44.6 | 20.4 |
| 1926-30 | 26.4 | 28.0 | 14.8 | 12.0 | 12.7 | 17.9 | 31.2 | 53.4 | 72.5 | 61.2 | 25.6 |
| 1931-35 | 33.4 | 35.9 | 17.7 | 15.0 | 14.9 | 23.9 | 37.0 | 73.1 | 100.3 | 87.3 | 33.1 |
| 1936-40 | 45.4 | 48.8 | 22.1 | 17.0 | 18.2 | 26.6 | 49.8 | 89.4 | 135.6 | 147.0 | 42.8 |
| 1941-45 | 48.4 | 58.3 | 26.9 | 24.7 | 22.8 | 29.6 | 57.3 | 113.7 | 184.9 | 198.4 | 53.8 |
| 1946-50 | 46.2 | 63.8 | 31.0 | 23.8 | 24.8 | 32.7 | 64.8 | 114.9 | 245.6 | 329.4 | 65.7 |
| 1951-55 | 31.5 | 65.8 | 35.6 | 27.6 | 25.6 | 36.4 | 71.4 | 155.2 | 320.4 | 475.3 | 77.1 |
| Female | | | | | | | | | | | |
| 1921-25 | 17.5 | 14.9 | 6.6 | 6.2 | 8.8 | 13.1 | 22.4 | 35.5 | 36.7 | 30.5 | 15.4 |
| 1926-30 | 19.5 | 22.0 | 9.0 | 8.5 | 10.9 | 16.8 | 27.4 | 43.6 | 51.4 | 35.6 | 19.9 |
| 1931-35 | 29.7 | 27.4 | 11.5 | 9.3 | 13.2 | 19.5 | 34.1 | 56.2 | 73.5 | 55.1 | 25.5 |
| 1936-40 | 38.9 | 39.0 | 14.6 | 12.1 | 14.4 | 23.3 | 41.4 | 66.4 | 92.1 | 87.0 | 31.9 |
| 1941-45 | 50.7 | 46.5 | 18.8 | 13.9 | 17.4 | 25.9 | 46.0 | 80.4 | 122.4 | 120.8 | 38.9 |
| 1946-50 | 40.2 | 53.0 | 24.2 | 15.1 | 18.4 | 27.6 | 52.0 | 97.9 | 154.9 | 191.5 | 46.5 |
| 1951-55 | 35.8 | 57.5 | 26.9 | 16.5 | 19.4 | 29.8 | 53.0 | 105.5 | 190.5 | 287.3 | 53.2 |
| Annual percentage change in rates | | | | | | | | | | | |
| Male | | | | | | | | | | | |
| 1921-25 | 4.1 | 4.0 | 6.6 | 3.3 | 2.2 | 5.1 | 5.5 | 2.7 | 6.7 | 6.6 | 4.6 |
| 1926-30 | 4.8 | 5.1 | 3.6 | 4.6 | 3.2 | 6.0 | 3.5 | 6.5 | 6.7 | 7.4 | 5.3 |
| 1931-35 | 6.3 | 6.4 | 4.5 | 2.5 | 4.1 | 2.2 | 6.1 | 4.1 | 6.2 | 11.0 | 5.3 |
| 1936-40 | 1.3 | 3.6 | 4.0 | 7.8 | 4.6 | 2.2 | 2.9 | 4.9 | 6.4 | 6.2 | 4.7 |
| 1941-45 | -1.0 | 1.8 | 2.9 | -7.7 | 1.7 | 2.0 | 2.5 | 2 | 5.8 | 11.0 | -1.0 |
| 1946-50 | -7.4 | .6 | 2.2 | 3.0 | .6 | 2.2 | 2.0 | 6.2 | 5.5 | 7.6 | 3.3 |
| Female | | | | | | | | | | | |
| 1921-25 | 2.2 | 8.1 | 6.4 | 6.7 | 4.4 | 5.2 | 4.1 | 4.2 | 7.0 | 3.2 | 5.2 |
| 1926-30 | 8.8 | 4.5 | 5.1 | 1.7 | 3.9 | 3.1 | 4.5 | 5.2 | 7.4 | 9.1 | 5.1 |
| 1931-35 | 5.5 | 7.3 | 4.9 | 5.5 | 1.8 | 3.6 | 4.0 | 3.4 | 4.6 | 9.6 | 4.6 |
| 1936-40 | 5.5 | 3.6 | 5.2 | 2.7 | 3.8 | 2.1 | 2.1 | 3.9 | 5.8 | 6.8 | 4.0 |
| 1941-45 | -4.6 | 2.7 | 5.3 | 1.7 | 1.1 | 1.3 | 2.4 | 4.0 | 4.8 | 9.6 | 3.7 |
| 1946-50 | -2.3 | 1.6 | 2.1 | 1.9 | 1.0 | 1.5 | .4 | 1.5 | 4.2 | 8.4 | 2.7 |
| 1951-55 | | | | | | | | | | | |

¹ Annual percentage change in rates from one time period to the next, computed by the compound interest formula.

² All ages adjusted to the age distribution of the United States population at the 1950 census.

groups. The leukemia experience of the next 5 years should be sufficient to demonstrate whether this represents a temporary slackening in increase in rates or a beginning reduction similar to that already observed among infants under 1 year of age.

A plot of the leukemia death rates for nonwhites has also been prepared, but because of the irregularities due to the small numbers of deaths involved, it is impractical to illustrate them. It may be said, however, that the increase among nonwhites has been materially

greater than among whites, with less evidence of a slackening in rate of increase. Such reduction in increase among nonwhites as is evident in annual rates occurred about 1948, instead of in 1940, and is less marked than among whites. In addition, the reduction in rate of increase is only apparent among males under 5 years of age and among females under 35 years.

As a further test of changes in leukemia mortality rates since 1921, average annual age-specific death rates have been computed for

Table 2. Average annual leukemia death rates among nonwhite males and females for seven 5-year periods, 1921-55, and annual percentage change in rates¹

| Years | Age groups (years) | | | | | | | | | | |
|---------------------------------------|--------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----------------------|
| | 0-1 | 1-4 | 5-14 | 15-24 | 25-34 | 35-44 | 45-54 | 55-64 | 65-74 | 75+ | All ages ² |
| Average annual death rate per million | | | | | | | | | | | |
| Males | | | | | | | | | | | |
| 1921-25 | 6.6 | 5.7 | 3.0 | 5.3 | 8.2 | 10.8 | 13.8 | 18.8 | 7.7 | 9.8 | 8.6 |
| 1926-30 | 19.3 | 5.9 | 5.3 | 8.6 | 8.4 | 11.5 | 12.7 | 11.0 | 25.7 | 7.8 | 10.1 |
| 1931-35 | 22.5 | 9.8 | 8.5 | 9.0 | 11.3 | 16.7 | 18.3 | 28.9 | 20.9 | 28.9 | 14.7 |
| 1936-40 | 18.5 | 12.3 | 9.0 | 10.3 | 14.7 | 21.3 | 33.8 | 46.0 | 32.5 | 33.1 | 20.4 |
| 1941-45 | 25.7 | 15.3 | 12.6 | 13.8 | 18.8 | 26.0 | 42.6 | 55.0 | 53.7 | 36.8 | 26.2 |
| 1946-50 | 46.3 | 24.0 | 14.1 | 16.6 | 19.2 | 30.7 | 48.4 | 88.3 | 87.9 | 62.5 | 35.0 |
| 1951-55 | 35.8 | 27.2 | 18.3 | 23.5 | 23.2 | 35.3 | 59.5 | 117.7 | 175.7 | 159.1 | 49.3 |
| Females | | | | | | | | | | | |
| 1921-25 | 2.2 | 5.8 | 3.5 | 4.0 | 4.3 | 6.6 | 12.0 | 8.2 | 14.0 | 9.1 | 6.4 |
| 1926-30 | 5.6 | 8.0 | 4.0 | 3.9 | 4.4 | 10.9 | 11.8 | 13.6 | 5.6 | ----- | 7.1 |
| 1931-35 | 15.3 | 7.7 | 4.0 | 4.4 | 10.7 | 11.0 | 17.3 | 17.8 | 6.8 | 11.5 | 9.8 |
| 1936-40 | 24.5 | 10.7 | 5.3 | 8.6 | 10.4 | 19.1 | 26.0 | 28.0 | 15.7 | 12.4 | 14.6 |
| 1941-45 | 28.6 | 16.6 | 8.5 | 9.0 | 11.1 | 21.6 | 31.3 | 36.1 | 29.7 | 22.4 | 18.6 |
| 1946-50 | 25.7 | 17.2 | 10.9 | 12.4 | 14.5 | 23.3 | 35.9 | 46.0 | 44.0 | 29.8 | 22.6 |
| 1951-55 | 28.8 | 24.0 | 12.6 | 11.8 | 16.6 | 30.0 | 57.5 | 69.2 | 78.8 | 77.8 | 32.4 |
| Annual percentage change in rates | | | | | | | | | | | |
| Males | | | | | | | | | | | |
| 1921-25 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1926-30 | 23.8 | 0.7 | 12.4 | 10.0 | 0.6 | 1.4 | -1.6 | -10.0 | 27.4 | -5.0 | 3.1 |
| 1931-35 | 3.2 | 10.6 | 9.9 | .9 | 6.2 | 7.7 | 7.5 | 21.2 | -4.1 | 30.1 | 7.9 |
| 1936-40 | -3.8 | 4.8 | 1.2 | 2.7 | 5.3 | 5.1 | 13.1 | 9.8 | 9.3 | 2.8 | 6.7 |
| 1941-45 | 6.8 | 4.4 | 6.9 | 6.0 | 5.0 | 4.0 | 4.7 | 3.6 | 10.6 | 2.1 | 5.2 |
| 1946-50 | 12.5 | 9.4 | 2.2 | 3.8 | .5 | 3.4 | 2.6 | 10.0 | 10.4 | 11.2 | 5.9 |
| 1951-55 | -5.0 | 2.6 | 5.4 | 7.2 | 3.9 | 2.8 | 4.2 | 5.9 | 14.8 | 20.6 | 7.1 |
| Females | | | | | | | | | | | |
| 1921-25 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1926-30 | 21.0 | 6.9 | 2.9 | -.8 | .4 | 10.7 | -.3 | 10.6 | -16.7 | ----- | 2.2 |
| 1931-35 | 22.2 | -.9 | -.8 | 2.4 | 19.8 | .2 | 8.0 | 5.5 | 4.0 | ----- | 6.4 |
| 1936-40 | 9.9 | 6.8 | 6.0 | 14.5 | -.5 | 11.7 | 8.5 | 9.6 | 18.2 | 1.1 | 8.4 |
| 1941-45 | 2.4 | 9.3 | 9.8 | .9 | 1.2 | 2.5 | 3.7 | 5.2 | 13.5 | 12.7 | 4.9 |
| 1946-50 | -1.4 | .7 | 5.1 | 6.6 | 5.6 | 1.5 | 2.8 | 4.9 | 8.2 | 5.8 | 4.0 |
| 1951-55 | 2.3 | 6.9 | 2.8 | -.9 | 2.8 | 5.2 | 9.9 | 8.5 | 12.4 | 21.2 | 7.5 |

¹ Annual percentage change in rates from one time period to the next, computed by the compound interest formula.
² All ages adjusted to the age distribution of the United States population at the 1950 census.

seven 5-year periods during 1921-55, for each race and sex class. These are shown for whites in table 1 and for nonwhites in table 2. In addition, the annual percentage changes in rates from one time period to the next have been computed by the compound interest formula and are shown in the tables. The annual percentage changes in rates as given for whites in table 1 are in complete conformity with the trends of moving medians of annual rates which were shown in figures 1 and 2 and which have been described above.

For nonwhites, on the other hand, the annual percentage changes from one time period to the next, which are shown in table 2, are clearly too irregular to suggest any stabilization in rate of changes in rates for this race.

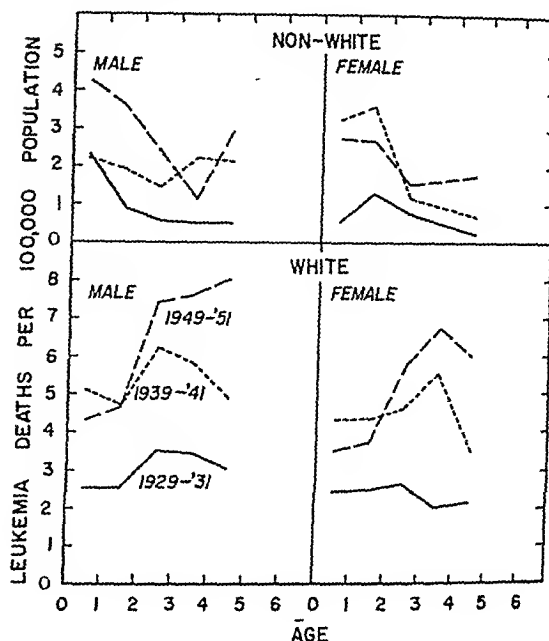
It may be added in passing that, among industrial policyholders of the Metropolitan Life Insurance Company, the total age-adjusted death rates from leukemia declined between 1951 and 1954, the last year for which rates were published (3). Whether or not this represents a temporary fluctuation, or a real decline in rates for this group, remains to be seen.

Persons Under 5 Years of Age

Hewitt (4) has extended the observation of Cooke (2) that leukemia tended to show a peak of occurrence in the third and fourth years of life. Walter and Gilliam (5) showed that this peak was present during 1949-51 for the white but not for the nonwhite population of the United States. In view of these observations, more detailed examination of mortality data for persons under 5 years of age appeared desirable. Accordingly, average annual death rates for single years under 5 were computed for 3-year periods centering around the censuses of 1930, 1940, and 1950. The results are shown in figure 3. Although the data for nonwhites are based on small numbers, there is in the three time periods a general tendency in this race for the rates to decline after the first year of life. Among white males, to the contrary, there is an opposite tendency which is present to some extent in all three time periods. Among white females, the latter general tendency is evident in the last two periods although not in the first.

Examination of mortality trends for the ages

Figure 3. Leukemia death rates for single years of age under 5 years for 1929-31, 1939-41, and 1949-51.



under 5 years during intercensal years is unprofitable because of the unavailability of reliable estimates of the populations at risk. Since 1940, however, the Bureau of the Census has published estimates (6) of the population for the ages under 1, 1 and 2, and 3 and 4 years. Leukemia death rates for each year, 1940 to 1955, inclusive, have been computed from these estimates, and the results for white males and females are plotted on a semilogarithmic scale in figure 4. For both sexes there is a regular decline in the rates for infants under 1 year old, which is offset in about the same degree by a rise in rates for children 3 and 4 years of age. Among females 1 and 2 years old the rates have remained at a fairly constant level, while in the males of these ages there is a tendency towards a decline in rates since about 1950.

Among the nonwhites the annual fluctuations arising from the small numbers of deaths make it impossible to form reliable conclusions about trends for these ages.

Lifetime Probability of Dying of Leukemia

Throughout the entire life span from birth onwards, the probability of dying of a disease

is a function not only of changing age-specific mortality due to that disease, but of changing survivorship from all other competing causes of death. As is well known, there have been marked fluctuations during the last 25 years, in the United States and elsewhere, with respect to expectation of life and causes of death in general. To estimate the combined effect of these general forces, together with annual changes in leukemia mortality, the lifetime probability of dying of leukemia has been computed for 6 years, distributed at 5-year intervals 1930 to 1955, inclusive, by a method from Spiegelman (7), which employs United States life tables and age-specific leukemia mortality for each year listed. The results of these computations are shown in table 3 for both races and for each sex. The percentage change in probability of dying of leukemia during each 5-year interval is also shown in the table.

In 1930 the betting odds were 185 chances in 100,000, or slightly less than 0.2 percent, that a white male would eventually die of leukemia. By 1955 this probability had risen to 684 chances in 100,000, or a little less than 0.7 percent. Changes of a similar kind, although of

Table 3. Changes in lifetime probability¹ of dying of leukemia, from birth onward

| Year | White | | Nonwhite | |
|---|---------|---------|----------|---------|
| | Males | Females | Males | Females |
| Lifetime probability of dying of leukemia | | | | |
| 1930----- | 0.00185 | 0.00150 | 0.00059 | 0.00032 |
| 1935----- | .00243 | .00198 | .00083 | .00057 |
| 1940----- | .00350 | .00287 | .00149 | .00088 |
| 1945----- | .00418 | .00357 | .00166 | .00118 |
| 1950----- | .00579 | .00499 | .00240 | .00193 |
| 1955----- | .00684 | .00576 | .00348 | .00260 |
| Percent increase in probability | | | | |
| 1930-35----- | 31 | 32 | 41 | 78 |
| 1935-40----- | 44 | 45 | 80 | 54 |
| 1940-45----- | 19 | 24 | 11 | 34 |
| 1945-50----- | 38 | 40 | 45 | 64 |
| 1950-55----- | 18 | 15 | 45 | 35 |

¹ Computed from United States Life Tables and age-specific leukemia mortality for the indicated years, by a method from Spiegelman (7).

different degree, are noted for white females and for nonwhites of each sex.

The percentage increase in probability of death from leukemia for each 5-year interval is shown in the lower half of table 3. The rate of increase is greater for nonwhites than for whites, but in all classes there is a distinct tendency toward a decline in rate of increase. Also, the changes in rate of increase, as estimated from lifetime probabilities, are less regular and are subject to greater fluctuation than when estimated from the annual probability of dying of leukemia, as shown in figures 1 and 2.

In view of the impossibility of determining from figure 4, with any degree of assurance, that the decline in death rates for infants under 1 year of age is entirely offset by the increase in rates for children 3 and 4 years of age, the probability of dying of leukemia during the first and second 5 years of life (birth to 5th birthday and 5th to 10th birthday) has been computed and is shown in table 4. The table shows that between 1950 and 1955 there has been a slight decline in accumulated risk of dying of leukemia in the first 5 years of life.

Figure 4. Trends of leukemia death rates for white males and white females under 1, 1 and 2, and 3 and 4 years of age, 1940-55.

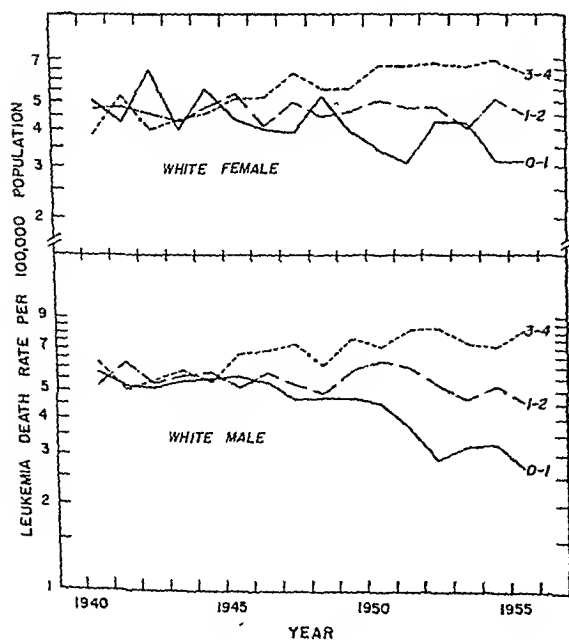


Table 4. Probability of dying of leukemia ¹

| Year | During first 5 years of life | | | | During second 5 years of life | | | |
|-----------|------------------------------|---------|----------|---------|-------------------------------|---------|----------|---------|
| | White | | Nonwhite | | White | | Nonwhite | |
| | Male | Female | Male | Female | Male | Female | Male | Female |
| 1930..... | 0.00014 | 0.00010 | 0.00006 | 0.00002 | 0.00011 | 0.00006 | 0.00004 | 0.00001 |
| 1935..... | .00016 | .00015 | .00005 | .00003 | .00010 | .00008 | .00005 | .00001 |
| 1940..... | .00026 | .00021 | .00011 | .00007 | .00016 | .00011 | .00008 | .00003 |
| 1945..... | .00027 | .00024 | .00010 | .00008 | .00015 | .00012 | .00009 | .00004 |
| 1950..... | .00030 | .00026 | .00014 | .00009 | .00019 | .00016 | .00010 | .00009 |
| 1955..... | .00026 | .00023 | .00010 | .00009 | .00022 | .00014 | .00012 | .00006 |

¹ See footnote table 3.

Taken together with the trends of annual death rates for the ages under 1 year and 1 to 4 years (figs. 1 and 2), this strengthens the belief that this reduction may be real and not a fluctuation such as was observed in the other direction between 1945 and 1950. Regardless, however, of the certainty which might be placed in this conclusion, the table clearly shows that the risk of dying of leukemia in the first 5 years of life has at least been stabilized since 1940. During the second 5 years of life, on the other hand, there has been a perceptible, though slight, increase since 1940 in the probability of dying of leukemia.

Individual States

Unpublished tables are available from the National Office of Vital Statistics which give leukemia deaths, by age, for each State since 1935. Prior to 1942, however, deaths were assigned to the State in which death occurred rather than to the State of residence of the decedent. No information is available to determine whether or not the leukemia deaths recorded in some States prior to 1942 include any substantial proportion of nonresidents. With this reservation in mind, age- and race-adjusted death rates were computed by the indirect method for each State for three 3-year periods centering around the censuses of 1930, 1940, and 1950. The indirect method employed involved multiplication of the 1949-51 age-specific rates for the United States as a whole, for whites and for nonwhites separately, by the corresponding State populations as enumerated at the 1930, 1940, and 1950 cen-

suses. This procedure yielded the deaths expected in each State during each period, on the basis of the 1949-51 experience of the white and nonwhite populations of the entire United States. The observed deaths, divided by those expected on this basis, yield a ratio which, when multiplied by the crude rate for the United States for 1949-51 (58.18 per million), gives the State rate adjusted for age and race.

Table 5 shows the leukemia mortality rates for each State grouped in standard geographic regions. The percentage increases in rates between 1930 and 1940, and between 1940 and 1950, are also given. Rates for the entire United States increased 64 percent between 1930 and 1940 as compared with an increase of 43 percent between 1940 and 1950. This decline in rate of increase is evident in each geographic region except New England. In this area 3 of the 6 States showed increases in the rate of increase, but the number of deaths recorded for them forms a relatively small proportion of the total deaths credited to the entire region. All other regions show a decline in percentage increase, but 12 other States do not exhibit such decline. These include nearly half of the States in the East and West South Central regions, three in the South Atlantic, and half of those in the Mountain States. In general, these all represent States having relatively small populations or relatively low leukemia mortality rates, or both.

Since the basic data available do not give the race of decedents for many of the States during 1929 to 1931, comparisons cannot be made for changes in rate of increase for each race sepa-

Table 5. Trends of leukemia mortality in the geographic regions and States of the United States¹

| Region and State | Number of deaths recorded | | | Average annual age- and race-adjusted death rates per million | | | Percent increase in rates | |
|---------------------------|---------------------------|---------|---------|---|---------|---------|---------------------------|---------|
| | 1929-31 | 1939-41 | 1940-51 | 1929-31 | 1939-41 | 1949-51 | 1930-40 | 1940-50 |
| New England..... | 649 | 1,045 | 1,787 | 27.5 | 39.9 | 57.6 | 45.1 | 44.4 |
| Maine..... | 55 | 86 | 149 | 21.8 | 31.4 | 48.6 | 44.0 | 54.8 |
| New Hampshire..... | 38 | 50 | 109 | 25.4 | 30.8 | 58.8 | 21.3 | 90.9 |
| Vermont..... | 20 | 35 | 101 | 17.6 | 30.0 | 79.0 | 70.5 | 163.3 |
| Massachusetts..... | 368 | 580 | 910 | 30.3 | 43.1 | 57.5 | 42.2 | 33.4 |
| Rhode Island..... | 53 | 77 | 106 | 27.9 | 36.3 | 41.7 | 30.1 | 14.9 |
| Connecticut..... | 115 | 217 | 412 | 26.2 | 42.8 | 63.6 | 63.4 | 48.6 |
| Middle Atlantic..... | 1,932 | 3,616 | 5,777 | 28.0 | 46.0 | 60.9 | 64.3 | 32.4 |
| New York..... | 1,118 | 1,973 | 3,084 | 33.7 | 50.8 | 65.3 | 50.7 | 28.5 |
| New Jersey..... | 243 | 526 | 911 | 23.4 | 44.6 | 60.5 | 90.6 | 35.7 |
| Pennsylvania..... | 571 | 1,117 | 1,782 | 22.5 | 39.8 | 54.6 | 76.9 | 37.2 |
| East North Central..... | 1,663 | 3,379 | 5,577 | 24.2 | 43.2 | 58.4 | 78.5 | 35.2 |
| Ohio..... | 404 | 834 | 1,489 | 22.0 | 40.4 | 59.1 | 83.6 | 46.3 |
| Indiana..... | 177 | 362 | 709 | 18.8 | 34.4 | 56.4 | 83.0 | 64.0 |
| Illinois..... | 549 | 1,136 | 1,633 | 27.2 | 49.4 | 59.2 | 81.6 | 19.8 |
| Michigan..... | 297 | 610 | 1,045 | 23.6 | 41.7 | 55.4 | 76.7 | 32.9 |
| Wisconsin..... | 236 | 437 | 701 | 28.6 | 46.3 | 62.6 | 61.9 | 35.2 |
| West North Central..... | 1,031 | 1,851 | 2,951 | 28.1 | 45.0 | 63.5 | 60.1 | 41.1 |
| Minnesota..... | 272 | 473 | 739 | 38.2 | 56.8 | 75.9 | 48.7 | 33.6 |
| Iowa..... | 217 | 345 | 546 | 29.7 | 42.9 | 61.0 | 44.4 | 42.2 |
| Missouri..... | 275 | 461 | 739 | 26.9 | 39.8 | 56.3 | 48.0 | 41.5 |
| North Dakota..... | 31 | 85 | 109 | 18.3 | 47.9 | 58.1 | 161.7 | 21.3 |
| South Dakota..... | 31 | 75 | 137 | 26.0 | 40.8 | 67.0 | 56.9 | 64.2 |
| Nebraska..... | 86 | 177 | 286 | 22.7 | 44.3 | 64.6 | 95.2 | 45.8 |
| Kansas..... | 119 | 235 | 395 | 22.4 | 42.1 | 62.4 | 87.9 | 48.2 |
| South Atlantic..... | 680 | 1,396 | 2,822 | 19.3 | 33.2 | 51.8 | 71.5 | 56.0 |
| Delaware..... | 12 | 36 | 56 | 18.3 | 47.6 | 59.2 | 45.4 | 24.4 |
| Maryland..... | 127 | 178 | 338 | 30.4 | 36.4 | 52.1 | 19.7 | 43.1 |
| District of Columbia..... | 51 | 118 | 117 | 41.9 | 70.5 | 55.4 | 68.3 | 21.4 |
| Virginia..... | 105 | 216 | 443 | 18.8 | 33.3 | 52.2 | 77.1 | 56.8 |
| West Virginia..... | 62 | 152 | 317 | 14.7 | 31.2 | 56.0 | 112.2 | 79.5 |
| North Carolina..... | 94 | 240 | 474 | 14.1 | 30.8 | 48.9 | 118.4 | 58.8 |
| South Carolina..... | 47 | 104 | 250 | 14.2 | 27.3 | 53.4 | 92.3 | 95.6 |
| Georgia..... | 100 | 221 | 439 | 16.6 | 32.1 | 52.4 | 93.4 | 63.2 |
| Florida..... | 82 | 131 | 388 | 23.9 | 26.7 | 48.1 | 11.7 | 80.1 |
| East South Central..... | 352 | 772 | 1,595 | 15.8 | 30.0 | 53.1 | 89.9 | 77.0 |
| Kentucky..... | 94 | 217 | 440 | 13.9 | 28.1 | 50.8 | 102.2 | 80.8 |
| Tennessee..... | 99 | 248 | 515 | 16.0 | 34.0 | 57.7 | 112.5 | 69.7 |
| Alabama..... | 94 | 178 | 366 | 17.2 | 28.9 | 49.4 | 68.0 | 70.9 |
| Mississippi..... | 65 | 129 | 274 | 16.6 | 28.6 | 54.4 | 72.3 | 90.2 |
| West South Central..... | 226 | 1,006 | 2,180 | 16.1 | 31.5 | 55.2 | 95.7 | 75.2 |
| Arkansas..... | 55 | 105 | 253 | 13.3 | 22.4 | 48.4 | 68.4 | 116.1 |
| Louisiana..... | 79 | 175 | 403 | 18.3 | 33.8 | 61.6 | 84.7 | 82.2 |
| Oklahoma..... | 92 | 180 | 358 | 16.4 | 29.2 | 53.0 | 78.0 | 81.5 |
| Texas ² | 546 | 1,166 | 1,166 | 34.3 | 55.5 | 55.5 | 61.8 | 61.8 |
| Mountain..... | 199 | 399 | 821 | 21.0 | 35.2 | 55.9 | 67.6 | 58.8 |
| Montana..... | 30 | 73 | 118 | 21.4 | 45.6 | 63.0 | 113.1 | 38.2 |
| Idaho..... | 30 | 46 | 105 | 25.8 | 31.7 | 59.9 | 22.9 | 89.0 |
| Wyoming..... | 9 | 24 | 39 | 16.5 | 36.4 | 47.3 | 120.6 | 29.9 |
| Colorado..... | 68 | 132 | 234 | 23.8 | 39.3 | 56.3 | 65.1 | 43.3 |
| New Mexico..... | 6 | 33 | 86 | 6.0 | 25.7 | 49.9 | 328.3 | 94.2 |
| Arizona..... | 19 | 38 | 104 | 19.2 | 31.3 | 52.4 | 63.0 | 67.4 |
| Utah..... | 32 | 45 | 108 | 25.4 | 30.9 | 56.4 | 21.7 | 82.5 |
| Nevada..... | 5 | 8 | 27 | 20.7 | 26.0 | 57.9 | 25.6 | 122.7 |
| Pacific..... | 727 | 1,384 | 2,794 | 31.4 | 46.1 | 61.4 | 46.8 | 33.2 |
| Washington..... | 117 | 241 | 448 | 26.4 | 44.4 | 59.0 | 68.2 | 32.9 |
| Oregon..... | 99 | 161 | 283 | 35.6 | 46.8 | 57.8 | 31.5 | 23.5 |
| California..... | 511 | 982 | 2,063 | 32.0 | 46.5 | 62.5 | 45.3 | 34.4 |
| United States..... | 7,459 | 14,848 | 26,304 | 24.7 | 40.5 | 58.2 | 64.4 | 43.3 |

¹ Brief reference is made in the text to some limitations of these data.² 1930 and 1931 only.³ Admitted to death registration States in 1933.

ately, by State. For the entire United States, however, there was a much greater percentage increase for nonwhites during both periods, being 98 percent and 62 percent, respectively, for nonwhites as compared with 64 percent and 42 percent for whites.

MacMahon (8), who studied the increase in leukemia mortality among the white population of each State between two periods, 1938-42 and 1949-53, was impressed with the large percentage increase exhibited in five of the Mountain States—Nevada, Utah, Arizona, Idaho, and Montana. Three, and possibly four, of these States showed a greater percentage increase in leukemia deaths between 1940 and 1950 than was observed between 1930 and 1940. Inasmuch as the number of deaths on which the increases are based is small; since these States, except Utah, lack University Medical Centers, it is probable that some of their residents died outside the State, with the result that part of their increase in mortality from leukemia after 1940 is an artifact; and since 11 other States not in this region exhibited the same type of trend, we can see no reason to single these States out for particular consideration on the basis of these data.

Mortality Among Physicians

No published data are available in the United States for a fully adequate analysis of leukemia

mortality trends among physicians as a whole, or for any physician speciality group. With the exception of the report of Dublin and Spiegelman (9), all studies of leukemia mortality among physicians have depended upon leukemia deaths listed in the obituaries published in the *Journal of the American Medical Association*. Since these do not always give the cause of death, and since all physicians' deaths known to the association are not listed, it has not been possible to compute adequate mortality rates from these data. It has been feasible, nevertheless, to compute age-specific ratios of listed leukemia deaths to all deaths listed among physicians, and to compare them with ratios similarly derived for deaths recorded in the white male population as a whole. This has been accomplished, notably by Henshaw and Hawkins (10) and by Peller and Pick (11). Both studies yielded higher leukemia ratios among physicians than among the general white male population as a whole.

Ratios of this kind, even when computed on an age-specific basis, do suffer from some uncertainty as to how much of the result reflects an excess of leukemia and how much may be due to a deficit in other causes of death. At the present time, at least, such ratios would somewhat overestimate the rate of leukemia among physicians since Dickinson and Martin (12) have shown a deficit of 7 percent in mortality from all causes for this profession during the

Table 6. Average annual leukemia death rates for physicians compared with rates for all white males, United States, 1938-42

| Age group (years) | Number of physicians ¹ | Leukemia deaths, physicians, 1938-42 ² | Average annual leukemia death rate per million | | Ratio of rates: physicians/white males |
|-------------------|-----------------------------------|---|--|-------------------|--|
| | | | Physicians | White males | |
| All ages..... | 175, 159 | ³ 102 | 116.5 | ⁴ 66.5 | 1.75 |
| 20-34..... | 42, 471 | 11 | 51.8 | 18.3 | 2.83 |
| 35-44..... | 40, 029 | 10 | 50.0 | 28.6 | 1.75 |
| 45-54..... | 31, 314 | 18 | 115.0 | 53.9 | 2.13 |
| 55-64..... | 31, 352 | 22 | 140.3 | 102.1 | 1.37 |
| 65-74..... | 22, 186 | 31 | 279.5 | 156.4 | 1.79 |
| 75-84..... | 6, 788 | 9 | 265.2 | 182.0 | 1.46 |
| 85 and over..... | 1, 019 | 1 | 196.3 | 125.9 | 1.56 |

¹ From Dublin and Spiegelman (9).

² From Spiegelman, personal communication.

³ Including 7 females, aged 34, 38, 40, 47, 54, 66, and 71 years.

⁴ Adjusted to age distribution of physician population.

Table 7. Average annual leukemia death rates for physicians compared with rates for all white males, United States, 1949-51

| Age group (years) | Number of physicians ¹ | Leukemia deaths, physicians, 1949-51 ² | Average annual leukemia death rate per million | | Ratio of rates: physicians white males |
|-------------------|-----------------------------------|---|--|---------------------|--|
| | | | Physicians | White males | |
| All ages | 204, 450 | 85 | ³ 145. 4 | ³ 104. 9 | 1. 39 |
| 20-34 | 50, 566 | 4 | 26. 4 | 24. 3 | 1. 09 |
| 35-44 | 54, 496 | 6 | 36. 7 | 34. 3 | 1. 07 |
| 45-54 | 38, 270 | 7 | 61. 0 | 68. 5 | . 89 |
| 55-64 | 27, 411 | 14 | 170. 2 | 148. 7 | 1. 14 |
| 65-74 | 21, 952 | 32 | 485. 9 | 277. 1 | 1. 75 |
| 75-84 | 10, 256 | 21 | 682. 5 | 389. 1 | 1. 75 |
| 85+ | 1, 499 | 1 | 222. 4 | 372. 8 | . 60 |

¹ From Dickinson and Martin (12).

² From Dickinson and Martin, personal communication.

³ Adjusted to the age distribution of physicians in 1940, as reported by Dublin and Spiegelman (9).

years 1949 to 1951. Such ratios would also overestimate the rates of leukemia mortality among physicians if leukemia deaths were more regularly listed in the obituaries than were other causes of death.

Because of the interest in leukemia among physicians, it appears desirable to place on record their death rates and their trend. This is now possible through the courtesy of M. Spiegelman of the Metropolitan Life Insurance Company and Dr. F. G. Dickinson and L. W. Martin of the Bureau of Medical Economic Research of the American Medical Association, who have supplied us with unpublished data. These data are shown in detail in table 6 for the 5-year period centering around 1940 and in table 7 for the 3-year period centering around 1950. Spiegelman identified 102 leukemia deaths (table 6) among physicians between 1938 and 1942. This is 26 percent more than the 81 deaths which Henshaw and Hawkins (10) found listed in physicians' obituaries during the same period.

The tables also show rates for the same periods for white males in the United States as a whole, and ratios of the age-specific leukemia mortality rates for physicians to the rates for white males. These ratios decreased with age in 1940, but increased with age in 1950. In 1940 the age-adjusted rate was 75 percent greater for physicians than for white males as a whole, while in 1950 it was only 39

percent greater. This is due to the fact that the rates among physicians increased only 25 percent in 10 years, while those for all white males of the same ages increased 58 percent. Comparison of leukemia mortality rates in tables 6 and 7 also shows that there was a decrease in leukemia mortality in the 10-year period, for physicians under 55 years of age, which was more than offset by increases for those over 55.

Summary and Discussion

Mortality attributed to leukemia in the death registration States of the United States between 1921 and 1955 has been characterized by:

1. An increase in the age-adjusted death rate for all ages, in both races and in each sex, with the rate of increase greater for nonwhites than for whites.

2. A decline since about 1940 in the rate of increase among white persons, but little tendency toward a decline among nonwhites. For the entire population the percent increase dropped from 64 percent between 1930 and 1940 to 43 percent between 1940 and 1950.

3. A regular decline since 1940 in death rates for white infants under 1 year of age.

4. An increase since 1940 in death rates for white children 3 and 4 years of age, which tends to offset the decrease exhibited among infants. For all ages under 5 years, in both

rates and in each sex, however, the accumulated probability of dying from leukemia has been relatively stable since 1940, with an apparent tendency to decline among the whites since 1950.

5. A perceptible decline since 1940 in the rate of increase for all other age groups in the white race except for those 75 years of age and over. This tendency is more marked in the younger ages, and its magnitude decreases with age.

6. A smaller percentage increase between 1940 and 1950 than between 1930 and 1940, in two-thirds of the States.

7. A smaller increase between 1940 and 1950 among physicians than among white males of the same ages in the general population.

If these trends among whites persist, they will eventually result in stabilization or actual decline in the leukemia death rates for all ages. Without projection into the future, however, the trends presently evident provide no support whatsoever for a theory which postulates a sharp increase within the last 15 years in leukemogenic factors affecting the environment of Americans in general. On the contrary, the data suggest that such exposure has either become stabilized or has actually decreased during this period, if exposure to environmental factors is in fact responsible for the disease. The steady decrease in rate of increase in leukemia mortality in every age group among the white population under 75 years of age is entirely consistent with a theory of recent de-

crease in exposure of the general population to whatever causes operate to induce the disease.

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Haldeman Named Division Chief

Dr. Jack C. Haldeman has been appointed chief of the Division of Hospital and Medical Facilities of the Public Health Service. He succeeds Dr. Vane M. Hoge, who has been named executive director of the newly created Hospital Planning Council of Metropolitan Chicago. Dr. Hoge is retiring after 30 years with the Service.

As chief of the division with the rank of Assistant Surgeon General, Dr. Haldeman will administer the Hill-Burton program which, as its executive officer from 1946 to 1948, he helped to organize. In 1948 he became the first director of the Service's Arctic Health Research Center in Anchorage, Alaska, a post which he held until 1951. Subsequently he served as chief of the Division of General Health Services, Bureau of State Services, and for the past year he has been deputy chief of the division that he now heads.

Health economists are concerned with the organization of the market for health services and the net yield of investment in people for health. The "optimum" use of resources for the care of the sick and the promotion of health defines the special field of inquiry.

Toward a Definition of Health Economics

SELMA J. MUSHKIN, Ph.D.

TWO RECENT developments, each traceable to scientific advances in medicine, have focused attention on health economics.

First, new therapeutic products have provided specifics for many infectious diseases that, less than 20 years ago, were important causes of death in the United States and other industrial nations. These changes in medical techniques, which have increased the physician's capacity to deal effectively with diseases, have altered patterns in the organization of health services. Concomitantly, problems associated with the costs of medical care have been intensified and have stimulated prepayment arrangements for meeting these costs.

These changes have also given rise to many questions about the nature of the "market" for health services; about the relation of plant "capacity" (hospital facilities, for example) to use of health services; and about variations in "demand" attributable to prepayment. Especially urgent are questions about shifts in "demand" due to third party payments for limited types of medical care and about effects of alternative methods of payment and compensation on the "price" of health services. These questions are illustrative of the many raised by altered patterns in the organization of health

services and altered methods of paying for health care. They comprise one set of economic issues.

A second set of issues arises from another development in medical science: the possibility of increasing life expectancy. Average life expectancy at birth in many of the nations of Asia and Africa—nations which include almost two-thirds of the world population—was until recently about 30 years. This may be contrasted with almost 70 years of life expectancy achieved in the United States. The potential increase in life expectancy sharply focuses problems of balance between population and resources, between work forces and output, in the industrially underdeveloped but densely populated nations of the world. Scientific advances in medicine and public health can be applied quickly and with minimum expenditures to reduce death and morbidity rates in these nations. Spraying with DDT, immunization with BCG, and treatment with penicillin have yielded dramatic results in reduced mortality from malaria, tuberculosis, syphilis, and yaws.

Reduced death rate has intensified a search for answers to specific economic questions so that the achievements in health will not be dissipated by the pressures of increased population on low food supplies, with the consequent intensification of poverty. Some of these questions are related to the means by which the net yield of investment in people for health may

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be measured, the relative amounts of complementary and supporting capital investment and capital growth required, and the effects of changes in health status on productivity. At the same time, the changing monetary value of man, in his productive capacities, effects an impact on economic growth.

These two sets of issues in common require, among other things, an analysis of the optimum use of resources for maintaining and improving the people's health and the quality of the population. Both sets of issues have been pressed by the requirements for policy formulation—public for health issues facing less developed nations, and largely private for health issues arising out of the medical market, at least within the United States.

Administrative Definition

What then is health economics? Generally, "health economics" has been used by health administrators to refer to any investigation that deals with money in its relationship to health. The two medical journals with economics in their titles perhaps give a clue to what those in the health professions consider to be encompassed within the scope of a health economics inquiry. One of these journals, *Medical Economics*, is essentially a business journal for physicians, and regularly features articles on physicians' office methods and finances. Special feature articles in 1957, for example, deal with the physicians' income, hours of practice, specialties, fee determination, voluntary health insurance developments as they bear on the physicians' practice and finances, cost of practice including malpractice insurance, taxation problems such as definitions of business expense, and problems of estate planning.

The second periodical, *Public Health Economics*, published by the Bureau of Public Health Economics of the University of Michigan's School of Public Health, abridges articles and news items. Materials abridged are classified currently in the following manner: legislation, governmental programs in operation (Federal and State), prepayment plans, health personnel, hospital and other health facilities, receipt of care, and developments in other countries. The first issues of this pe-

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Thus "health economics" has been both broadly conceived to encompass the range of social sciences, including public administration, and narrowly conceived to deal with business methods of organization and of payment.

Economic Propositions

What has the professional economist had to say about health economics? Until fairly recently, economists have given little thought to the market organization of health services or to the net economic yield of investment in the health of people. This lack of attention to the medical market may be traced to the special characteristics of medicine that mark it as an exception to economic propositions that explain the mechanisms of the market generally.

There are several important characteristics of the medical market that differentiate it from the market of classical economics. First, the profit motive is not adequate as an explanation of the activity in the medical "market." Hospital care throughout the centuries has been either primarily public or under the auspices of nonprofit institutions. While services of physicians in the United States are organized on an individualistic basis as any profession or enterprise (and it is fair to say, even more so), physicians have accepted their social role in the community and have often cared for the sick and promoted health without remuneration for their time and skill. Also, professional motivation in pursuing the medically interesting case often causes the medical practitioner to evaluate his leisure, income, and work differently from, say, skilled operatives in industry.

Second, in medicine, price is not the sole

means by which demand and supply of medical and health services may be equated. As a social responsibility, private associations, nonprofit in form, and private practitioners have provided necessary services for those unable to pay. And fees for services have been graded in accord with rough evaluations of ability to pay. In the economy generally, however, the price system is the instrument for the allocation of goods among consumers and their competing demands. Government traditionally has been looked upon as an instrument to correct the market mechanism where it fails markedly to satisfy the wants of individuals. In the sphere of medical care, however, individual needs have been met historically, at least in part, by nonprofit organizations and by the practitioner guided by the code of Hippocrates.

Moreover, a competitive price has been generally absent from the medical market, at least until recently. In part, this is attributable to the absence of a homogeneous commodity. Skill and capacity vary with the individual abilities of health personnel, and needs of patients differ, too.

Third, medical services are personal services; money cannot veil the transaction. The cold impersonality of money, so much a part of all other "business" transactions, is largely absent from medical exchanges between those who give services and those who receive them. For a part of what one buys in medical services is a personal relationship.

Fourth, consumers do not choose between health services and other goods and services by means of a simple rational weighing of choices, for (taking consumer health expenditures as a guide) the consumer prefers to avoid, or remove the circumstances that compel, using resources for health purposes. In every income group there is a heavy concentration of expenditures for medical care among those families who suffer illness. This concentration suggests that consumer outlays are undertaken primarily to cure or provide services for the sick. This pattern of consumer preferences may be illustrated in other ways. For example, in any year, only about one-third of the population purchases dental services (1). About one-fifth of physician services are for preventive health services; the remaining serv-

ices are for the cure and diagnosis of disease (2). Moreover, data on expenditures and on the relation of expenditure to income suggest that the familial patterns of consumption are distorted when illness strikes.

Efficient organization of economic resources for health, guided by the consumer's preference, depends upon the consumer's knowledge and the extent of his education. Despite persistent efforts to educate consumers they reveal considerable absence of accurate knowledge about the quantity and quality of health services required. The nature of the medical service itself and its intangible character reinforce the consumer's lack of knowledge about his purchases, and impede a rational choice that could guide the allocation of resources.

Furthermore, in an individual's purchase of many medical services, there is a social utility. Purchase of health services for the prevention of contagious and infectious diseases, such as smallpox, poliomyelitis, and whooping cough, provides a utility, or a benefit, for the community as a whole. Even curative health services, such as those for the treatment of tuberculosis or syphilis, help to prevent the spread of the diseases; thus an individual's purchase of services for his own cure benefits his neighbor. These important "extra-buyer benefits," or "external economies" in the prevention of disease, are instances in which individual demand and market price underestimate the marginal and total benefits provided. Preventive health services would be undervalued, underpriced, and underproduced, unless administrative agencies (government or nonprofit) entered the market.

Population and Resources

While economists have devoted little attention to the medical market they have long dealt with population growth in relation to limited physical resources. Malthus' *Essay on the Principle of Population*, first published in 1798, triggered a series of economic postulates giving a man-against-nature view which earned economics its designation as the dismal science. Most important of these postulates for health programming was the iron law of wages.

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Alfred Marshall, whose *Principles* (written in the decade 1881 to 1890) represents a transi-

tion from classical to modern economics, wrote: ". . . earlier economists argued as though man's character and efficiency were to be regarded as a fixed quantity. . . . [Economics] is getting to pay every year a greater attention to the pliability of human nature, and to the way in which the character of man affects and is affected by the prevalent methods of the production, distribution and consumption of wealth" (3a).

Marshall, dealing with the agents of production in book 4 of his *Principles*, considers not only the growth of the population but the health and strength of the population. Marshall opened a chapter of this book with, "We have next to consider the conditions on which depend health and strength, physical, mental and moral. They are the basis of industrial efficiency, on which the production of material wealth depends; while conversely the chief importance of material wealth lies in the fact that, when wisely used, it increases the health and strength, physical, mental and moral of the human race" (3b).

While some few economists have recognized the concept of "personal capital," of personal hazards to workers in industry as "social costs," and of health (physical and mental) as a component of workers' efficiency, by and large these concepts have been qualifications rather than integral parts of their economic propositions.

Three interrelated facets of analysis are essentially involved. Population pressures on resources, constituting one facet, have been dealt with in economic discussions of underdeveloped areas of the world (4). The Malthusian theory has gained new importance in this context.

The second facet is the capital value of man. Dublin and Lotka, demographers and actuaries rather than economists, have contributed the major work on the methodology of evaluating the capital represented by man (5). For their purpose they define capital value as the present and discounted value of future earning power of the wage earner, reduced by the costs of birth, upbringing, and maintenance during a working life. In their study they traced the thinking on man's capital value through the works of Sir William Petty, Adam Smith, William Farr, Frederick Engel, Alfred

Marshall, Irving Fisher, and others. Subsequent studies of special importance to this particular analysis are those made by Wolfbein and Wool for the U. S. Department of Labor on the measurement of a working life (6, 7).

The third facet is the application of cost-benefit ratios to health programs. Work in this area has been traced to the 16th century study of Jean Bodin, to Richard Cantillon's essay on *The Nature of Commerce in General* published in 1755, and to Quetelet, a social statistician, who wrote in 1835: "In his early years, man lives at the expense of society; he contracts a debt which he must one day discharge; and if he dies before he has succeeded in doing so, his life will have been a burden rather than a benefit to his fellow citizens . . ." (8). Economic studies of cost-benefit ratios of health programs have been carried out largely by health administrators and others in the health professions rather than by economists. Hermann M. Biggs expressed the health administrator's concern in his slogan coined more than three and a half decades ago for the New York City Health Department: "Public health is purchasable; within natural limitations a community can determine its own death rate."

Winslow-Myrdal Exchange

Health cost-benefit analysis has gained new significance since World War II, especially in the studies and activities of international organizations. Major contributions to this analysis were made by C.-E. A. Winslow in his 1951 volume on *The Cost of Sickness and the Price of Health*, by the exchange of views between Winslow and Gunnar Myrdal before the Fifth World Health Assembly of the World Health Organization in 1952, and in the subsequent volume by Myrdal on *Economic Theory and Underdeveloped Regions* published in 1957.

Differences between Winslow's views and those of Myrdal are largely differences in emphasis. Winslow argued that investment in health promised large dividends in life capital. For in the less-developed areas of the world where there was no surplus to invest in the profitable enterprise of health, the vicious cycle

of poverty and disease pursued its course unchecked. "Men and women were sick because they were poor; they became poorer because they were sick, and sicker because they were poorer" (9a). The doctrine that successful health programs will increase the sum of human misery, Winslow said, is founded on the fallacious assumption that there is some basic law limiting economic development to that which has at the moment been realized. He pointed to improvements in agricultural production in the less developed areas of the world, to the development of mineral resources, to other social as well as economic measures improving the well-being of the population, and to the supplementation of these measures by efforts in some countries to limit excessive rates of population increases. He emphasized that the public health programs cannot be planned in a vacuum, but only as a vital part of a broader program of social improvement (9b, 10). He urged health leaders to "keep careful records of the cost of their health programmes and of the actual results attained, and make estimates of the economic gains corresponding to the decreases recorded in mortality and morbidity" (11).

Myrdal, starting from Winslow's thesis of a "vicious cycle," elaborates a theory of circular causation. In brief the Myrdal theory is that at one point of time there is accommodation in society between opposing forces. If either of two opposing forces changes, Myrdal writes, a change is bound to occur in the other force, "and start a cumulative process of mutual interaction in which the change in one factor would continuously be supported by the reaction of the other factor and so on in a circular way. . . . The point is not simply that many forces are working in the same direction. They are, in fact, not doing so. In general there are periods when opposing forces balance one another so that the system remains in rest until a push or a pull is applied at one point or another. When the whole system starts moving after such a shock the changes in the forces work in the same direction, which is something different. And this is so because the variables are so interlocked in circular causation that a change in any one induces the others to change in such a way that these secondary changes support the first change, with similar tertiary effects upon the

variable first affected, and so on" (12). Myrdal notes that if his theory of cumulative causation is valid, an upward movement of the entire system could be caused by pressures applied to one or several points in the system. However, in agreement with Winslow, he argues that rational policy should not induce a change in only one factor, especially with sudden or great force.

Drawing on his theory of cumulative causation, Myrdal argues that it is far from a simple matter to define or to measure the economic value of programs directed to the promotion of a population's health.

Costs and benefits are likely to be different in the short run from what they would be otherwise and to be different in different environments. Long-run values depend on the interrelationship of factors in any given society.

Myrdal emphasized that the success of health programs will depend entirely on whether they are appropriately integrated in a program of general economic development. He thus agreed with Winslow that health programs should "be a vital part of a broader program of social reconstruction."

Myrdal also agreed with Winslow that a health program could increase the number of persons in the productive age groups and their productivity. But, he emphasized, "the economic value of preventing premature death . . . depends entirely upon whether such an economic development is under way which ensures productive work for the greater number of people we thus keep alive" (13). If death rates are reduced in areas in which there is already substantial unemployment, poverty could be aggravated. While Myrdal, in common with Winslow, questioned the static notion of a "population optimum," in view of the expandability of production resources, he laid far greater emphasis than Winslow on the need for capital investment in production facilities. The amount of planned capacity required to prevent economic stagnation and increased distress would be enlarged by a truly successful health program.

Myrdal suggested that calculations on the price of health and the cost of illness should be based on something other than a dollar value of people.

Success of a program, for example, might be calculated on savings in life and abilities rather than dollars. Costs of alternative programs, or of their administration alone, might also be compared without reference to the dollar value of people.

The Winslow-Myrdal exchange has served to point up three needs: (a) greater precision in defining measurements of the cost of sickness, (b) more careful distribution between primary and secondary impacts and effects of health programs, and (c) a more careful formulation of assumptions that underlie alternative economic models (static or dynamic) used in estimating the costs of sickness. The exchange, moreover, has served to provide a broad perspective from which to explore the subject matter of health economics.

Health Economics Defined

Tentatively defined, health economics is a field of inquiry whose subject matter is the optimum use of resources for the care of the sick and the promotion of health. Its task is to appraise the efficiency of the organization of health services, and to suggest ways of improving this organization.

Promotion of health patently involves more than services of the health professions. It includes food, housing, recreation, and clothing, but, although they contribute importantly to health and wellness, they must be excluded from the scope of health economic studies. Unless they are excluded, the scope of these studies would encompass all economic activities and the special problems of health economics would receive inadequate treatment. While the scope of health economics may be delimited in this way, account must be taken of the competing uses of scarce resources, the impact of economic levels and economic growth on the status of health, and the need for health services.

The allocation of economic resources is generally determined in the market by the preference of consumers for different types of consumer goods and by the preference of workers for different types of work, leisure, and income. Welfare economists have taken these preferences, as expressed in the market, as the guide to optimum use of resources (14-16).

But there are a number of reasons why these preferences are not a wholly reliable guide to optimum use of health resources, even when the word optimum is used in this special sense.

First, the consumer would prefer to avoid illness and the purchase of health services. And, as has already been indicated, there are sizable "extra-buyer benefits" in an individual's purchase of medical services. Others in the community benefit from his purchase. Purchases by some consumers, for example, of influenza vaccination during the recent epidemic prevented further spread of the disease. The value of the medical services to each consumer did not depend upon his consumption of medical services alone but upon decisions of his neighbors as well. Those who made no purchases of influenza vaccine also benefited. Thus, the social value of medical services is far larger than the private marginal value. Individual decisions of a consumer are therefore inadequate as an efficient guide to the optimum allocation of resources for health purposes. For these individual decisions undervalue health services, which results in an underproduction of these services.

Second, some health services do not lend themselves to pricing on the market so that society's preference for them cannot be adequately valued on the market. Air and water pollution control measures, fluoridation of water supplies, and mosquito control are examples of these services. Furthermore, the price system for individual services is not applied in all cases: (a) the medically indigent are not excluded from care when they are sick, and (b) public safety and health sometimes require direct provision of health services and the removal of the individual from the community. Public hospital services for the mentally ill and for those with tuberculosis are illustrative of services placed outside the price-market system.

Third, the allocation of health resources is determined by a mixture of private market decisions and administrative decisions. "Administrative decisions" include those decisions made by the government, private nonprofit agencies, and professional organizations. Decisions concerning some health facilities (the building and size of a general hospital, for example) are

made by voluntary agencies. The Visiting Nurse Association determines the availability of part-time nursing care in many communities. In some places the content and quality of rural health services are determined by the regional organizations associated with medical schools. The principles underlying these administrative decisions and the way in which they influence the allocation of health resources need to be explored.

It may be that the principles underlying public budget decisions are applicable to administrative decisions of voluntary health agencies as well as public agencies. While economists have largely neglected theories of public expenditure in favor of theories of taxation and policy, analysis of governmental budgeting has begun. The Joint Economic Committee of Congress, by its 1957 study of Federal expenditure policy for economic growth and stability, has stimulated the development of principles for determining public budget (17, 18). Review of the work is needed to assess its contribution to our understanding of the optimum allocation of economic resources for health.

Consumer preferences as expressed in the market are one guide to optimum use, even though an incomplete guide. Another thing to look at is the effect of health programs on labor resources and production. Gains in output as a consequence of health services may equal or exceed (in a given period of time) the resources used for health. The number and quality of new manpower resources must be compared with the health manpower used in the provision of services. For example, it would be possible to compare the amount of manpower used in providing health services in the United States with gains in labor force participation resulting from reduced death rates. Reduced death rates in the United States have resulted in a decline in separations from the labor force at all ages up to age 65. Despite the marked delay in entry into the labor force by young people, and the earlier exit from the labor force by those in the older age groups, the male worker today puts in many more years of work than did his counterpart 50 years ago (19). The problems of cost-benefit measurement have been mentioned in the discussion of the Winslow-Myrdal exchange. The concepts and

methods of measurement require extensive further study. Not potential but actual increases in production under prevailing conditions of employment must be measured against the cost of health services in order to determine their relationship to the economic optimum.

One additional aspect of the problem may be mentioned. The economic optimum bears some relation to the amount of health resources required to provide care for all the illnesses in the population. The optimum may be below or above the amount of health services suggested by professional standards. Standards of health resource requirements are familiar to the health practitioners. Professional planning for health services and setting standards are characteristics of the health field. Standards of professional education, requirements for entrance into the health professions, hospital standards, and even in some instances standards of care are determined by professional groups. Moreover, government, by compulsory measures, has enforced standards of public health. For example, vaccination is required as a condition for admission to school, and standards are set for the distribution of milk, for food handlers, and for water supplies.

The National Health Survey is designed to provide data on sickness in the population. In discussing the potential uses of data from such a survey the U. S. National Committee on Vital and Health Statistics indicated that quantitative information would provide a basis for sound evaluations of health facilities, personnel, and programs as well as for a determination of how available resources should be divided among programs (20). In an earlier study, Lee and Jones related sickness in the population to the needed volume of health services and manpower requirements (21).

The subject matter of health economics includes factors that determine price patterns for health services, ways in which the materials, goods, health manpower, and facilities are brought together at the right time and place and in the right proportions to provide health services, and ways in which the different health goods and services are coordinated. The mechanisms by which goods and services are coordinated are "trade" in the market by the consumer's purchases of health goods and services,

professional codes of performance, and governmental and voluntary agency planning and budget decisions.

Health economics also includes in its subject matter the effects of health services on the size, character, and efficiency of the work force and population. It seeks to gain an understanding of the interaction of levels of living, production, and physical and mental wellness. The health factors which make for work absence, for retirement from work, for labor turnover, for the quality of performance on the job, and for job satisfaction fall within the scope and concern of health economics. The general topics which need to be considered in a comprehensive treatment of the economics of health include the interaction of health services and gross national output, population growth and economic development, and productivity of labor forces; health problems associated with industrial development; the supply of health services; utilization of services and their pricing; and financing of public and nonprofit agency programs.

The scope of inquiry included in the tentative definition of health economics is by no means novel. It is suggested by the work that is going forward in the bureau of medical economics of the American Medical Association, and the bureau of economic research and statistics of the American Dental Association. These organizations have explored the interaction of use and price of health services, health manpower, and facilities and consumer demand. The studies of Eli Ginzberg, Herbert Klarman, and others have increased our understanding of the economics of the hospital system (22). Ginzberg's work has also included an examination of the special economic problems of health manpower and methods of providing care (23, 24). And an increasing number of doctoral dissertations in economics have been concerned with these, or similar problems.

Summary

The health administrator has usually equated "health economics" with "money questions in the field of health." But, money is not the central problem of health economics. Health economics is concerned with the optimum use of scarce economic resources for the care of the

sick and the promotion of health, taking into account competing uses of these resources. The basic problems are of two kinds: the organization of the medical market, and the net yield of investment in people for health.

Consumer preferences are not an adequate guide to the optimum allocation of resources for health. There are a number of reasons why this is so. For one thing, a consumer would prefer to avoid the illnesses which require use of resources for health purposes. For another, his neighbors benefit from the medical services he purchases, for example, "flu shots" during the recent influenza epidemic. Individual decisions undervalue health services, and would result in underproduction of these services unless supplemented by actions of private voluntary agencies and government.

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Report of International Association of Gerontology

A conference of the European section of the Social Science Research Committee, International Association of Gerontology, held in Copenhagen, Denmark, in October 1956, discussed pensions, assistance, and levels of living, work and retirement, and family and institutional care. The conference recommended that, for purposes of comparison, data be collected in various countries on old people living alone or with relatives, those living in institutions and nonprivate households such as hotels, those who have surviving children, and those who are bedridden, housebound, or limited in movement.

Speakers from the United Kingdom, Italy, Denmark, and the Netherlands described and discussed surveys of income, budgets, living conditions, family relationships, pensions and retirement, research on employment, causes of institutionalization, costs of institutional versus home care, and sociomedical surveys.

The proceedings, entitled "The Need for Cross-National Surveys of Old Age," are available from the Division of Gerontology, University of Michigan, 1510 Rackham Building, Ann Arbor, Mich.

professional codes of performance, and governmental and voluntary agency planning and budget decisions.

Health economics also includes in its subject matter the effects of health services on the size, character, and efficiency of the work force and population. It seeks to gain an understanding of the interaction of levels of living, production, and physical and mental wellness. The health factors which make for work absence, for retirement from work, for labor turnover, for the quality of performance on the job, and for job satisfaction fall within the scope and concern of health economics. The general topics which need to be considered in a comprehensive treatment of the economics of health include the interaction of health services and gross national output, population growth and economic development, and productivity of labor forces; health problems associated with industrial development; the supply of health services; utilization of services and their pricing; and financing of public and nonprofit agency programs.

The scope of inquiry included in the tentative definition of health economics is by no means novel. It is suggested by the work that is going forward in the bureau of medical economics of the American Medical Association, and the bureau of economic research and statistics of the American Dental Association. These organizations have explored the interaction of use and price of health services, health manpower, and facilities and consumer demand. The studies of Eli Ginzberg, Herbert Klarman, and others have increased our understanding of the economics of the hospital system (22). Ginzberg's work has also included an examination of the special economic problems of health manpower and methods of providing care (23, 24). And an increasing number of doctoral dissertations in economics have been concerned with these, or similar problems.

Summary

The health administrator has usually equated "health economics" with "money questions in the field of health." But, money is not the central problem of health economics. Health economics is concerned with the optimum use of scarce economic resources for the care of the

sick and the promotion of health, taking into account competing uses of these resources. The basic problems are of two kinds: the organization of the medical market, and the net yield of investment in people for health.

Consumer preferences are not an adequate guide to the optimum allocation of resources for health. There are a number of reasons why this is so. For one thing, a consumer would prefer to avoid the illnesses which require use of resources for health purposes. For another, his neighbors benefit from the medical services he purchases, for example, "flu shots" during the recent influenza epidemic. Individual decisions undervalue health services, and would result in underproduction of these services unless supplemented by actions of private voluntary agencies and government.

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CONFERENCE REPORT

URBAN GROWTH

- POLICY
- PLAN
- PROCESS

ON MARCH 18-20, 1958, the National Health Forum of the National Health Council, sponsored by 63 member associations, was held in Philadelphia in conjunction with the 10th annual meeting of the National Advisory Committee on Local Health Departments.

The meetings dealt primarily with stresses produced by increasing urbanization; the financial and organizational implications of metropolitan growth; the effects and predictable eventualities facing local health departments, the dental and nursing professions, and hospitals; and the need to revise obsolete or anachronistic jurisdictions.

Comments of 15 of the 60 speakers at the forum follow. Their full identification appears on page 796.

Major Threads

In his summary, Wolman said the forum "took up the plight of 100 million in a world not made for them." He commiserated with those speakers who were distressed "by the existence of emotions, feelings, and action contrary to the prevailing mode of professional thought." And he offered philosophical solace as he described three major threads in the fabric of the discussion.

Signs

and



With this issue, a new department, Signs and Symptoms, is opened. Its main purpose is to provide a setting for what Dr. Joseph W. Mountin once called gems of public health practice. In addition to rare gems, it will give brief notice to other events or activities presumably of interest to readers. The doings of local and State health organizations will be the prime, but not the exclusive, focus of this department, especially if they indicate an important trend or some outstanding development or achievement. Contributions are welcomed.

Directory of Services

A directory describing all services in Greater Cleveland, Ohio, for care of the chronically ill has been published recently by the Cleveland Academy of Medicine and the Welfare Federation of Cleveland.

Intended as a reference for doctors and staff members of health and welfare agencies, the 118-page book lists about 200 different agencies.

In addition to medical facilities, the services described include nursing and rehabilitative, educational, financial, and casework assistance. Special sections deal with the treatment of chronically ill children, older persons, and veterans.

Information about each agency includes: services, eligibility requirements, area served, fees, hours, and referral procedures.

The directory has been distributed to some 2,800 doctors in the Cleveland area.

Traveling Clinic

Rural arthritic victims in Westchester County, N. Y., are being treated in their homes by therapists. The New York State Chapter of the Arthritis and Rheumatism Foundation sends therapists to patients unable to leave their homes or unable to travel to distant clinics.

The patients' private physicians approved the program and consulta-

tion with them has resulted in the training of visiting nurses in rehabilitation and the enlistment of help from social workers, nutritionists, and others.

By the beginning of June 1958, nearly 100 patients had been visited and 38 cases had been closed.

Pay for Patients

In a pilot program 25 mental patients have been working for pay at the New York State hospital in Central Islip.

Patients work at small handicrafts or such simple tasks as sewing buttons on cards.

Dr. Francis J. O'Neill, director of the hospital, reports that the patients are not approaching financial independence, but he feels the work advances rehabilitation.

Keeping Current

Responsibility for keeping current with public health literature is managed by the Saanich and South Vancouver Island Health Unit, Victoria, British Columbia, by giving each staff member an opportunity to report at a regular meeting on reading he has done.

H. George Henderson-Watts, senior sanitary inspector, reports that staff members give the title, author, and source; a brief statement of the author's purpose; a comment on

the noteworthy aspects of the paper; and the conclusions of the author and reviewer, if any. The paper itself is not read to the staff as a rule; the purpose of the review is simply to inform the staff and to encourage reading in pertinent fields. Reviews ordinarily are limited to 5-10 minutes. Time is also allowed for questions and discussions.

Periodicals, bulletins, and magazines are assigned on a 6-month or yearly basis.

Staff members are encouraged to read in detail the papers they review, to mark important points, and to read them a second time before offering their review.

Home Safety

The final report of the California Home Safety Project covering the years 1953-57 has been issued by the California Department of Public Health. The 165-page report reviews the home accident problem in California and outlines a program of State and local health department activities. It emphasizes the epidemiological approach to accident prevention. Distribution of the report is limited.

Hearing Tests

Audiometric tests for parents help them to understand corrective therapy and sound range limitations of children with hearing losses, the Alaska Department of Health reports.

The tests, offered during National Hearing Month in May 1958, were available to 5 communities; 196 adults were tested.

Glaucoma

In the summer of 1957 funds from the Public Health Service enabled the District of Columbia to begin examining residents over age 40 for glaucoma provided they were not under care of an eye doctor. By the end of May 1958, 3,866 patients had been examined and 27 cases of glaucoma verified. An additional 233 patients were under observation.

in the core city, a challenge to health agencies to make greater use of thruways and telephones, which he said are too little appreciated as great public health contributions.

- Research in planning, which he said "too often takes a turn in seeking how to curb those who persist in misunderstanding us."

He did not attempt to review all the major aspects of urban growth, but stressed Luther Gulick's admonition to recognize that the metropolitan area exists, to stop describing it and accept it as a form of behavior or misbehavior, and to revive the concept of community, with its implications for both individuals and the mass.

In conclusion, he said the fiscal basis for the urban complex needs much further consideration. He ended with, "Let us try to facilitate the transition and minimize the hurt."

Demographic Considerations

Speakers generally grasped the concept that growth of cities and populations poses a challenge of management or limitation. As a matter of policy, Isaacs declared that preoccupation with the welfare of random individuals and families was distracting attention from the common good. To illustrate public inconsistency, he observed that while health services reduce death rates, contributing to net population growth, the powers of the gods to destroy whole populations rest in the hands of a few, with the avowed objective of securing the redemption or well-being of every individual.

He predicted that "rigid governmental, economic, and social controls beyond any that we have known will be required" to protect the community interest, and that major mental stresses would result from "the reversal of almost unlimited freedom of action to strong community controls." While he conceded that regional confederation or cooperation might manage most metropolitan needs of the present, he said that in reality we have not been able to establish such instruments of government for more than a fraction of our population, and he asked, "Will we be able to solve the problems of 230 million in 20 years, or 330 million in 50 years?"

Price and others observed that the popula-

tion was not only growing but moving in a pattern which outnodes established structures of government.

Descriptions of this movement were offered by Cook, Moore, and Gulick. The world's population, Cook observed, is increasing by 45 million a year, 125,000 a day. The world over, too, there is a relentless movement of rural populations to urban communities. Once there, the people do not remain static. In the United States in recent years, more than 30 million people have moved each year at least from one house to another; 10 million moved to a different county.

Moore observed that there are now 174 metropolitan areas in the Nation, and by 1970 there will probably be 10 or 20 others. These areas contain almost 100 million people at present; by 1975 it is estimated that two-thirds of the American population will reside in such areas. Thirty percent of the Nation's inhabitants now reside in the 14 metropolitan areas having more than 1 million people.

Gulick pointed out that there is now a 600-mile linear city of 29 million people on the east coast. From San Francisco south, on the west coast, there is a similar development.

Characteristic of this development, Gulick said, "is a fluidity of population and economic life. This flow changes the basic structure of family, community, social relations, employment choices, shopping, education, communication, and political associations. The new metropolitanism profoundly disturbs most of our social institutions such as churches, clubs, societies, voluntary hospitals and charities, cultural and recreational establishments, political parties, and governmental operations."

The new metropolitan community is different from what we have known generally in the past. "It is a split-level creature," Gulick commented, "with personal human relations at one level, and broad, impersonal community consciousness at the other. And most people live in both levels."

Effect on Health Services

In the face of such growth, Haldeman observed that within the past 5 years there has been little progress in revising or extending

The functions or necessities of urban life have outstripped prevailing government structure and finance. Wolman reminded his audience that this condition was historically true of the core city even before the rise of the suburbs. He said he was in a state of chronic wonder that the core city provides a hundred services as well as it does. It cannot function in theory, but it works. Bread is delivered. Traffic moves. Milk appears on the doorstep. But even so, he emphasized, the core city had frustrations before it sprawled.

People are suspicious of planners. Wolman observed that planners who conceive on a broad scale are impatient with the failure of democracy implicit in the slowness of people to recognize their views and to behave accordingly. But, he suggested, the planner is no free orbiting sputnik; he must move in a stream of human behavior and behave accordingly, "to his intense regret."

Progress is fitful in health, urban government, hospital management. Wolman ventured that events move in obedience to quantum mechanics, in bunches rather than in a smooth continuum. He also observed that progress is geological rather than chronological, that it takes two decades for an idea to bear fruit. This law, he said, is as firm as the biological period of gestation. "Most solutions are ad hoc improvisations, which the planner calls concessions to expedience. As the issues are dramatized, the solutions become concessions to human behavior."

He added that concessions to political expediency are inevitable in human society and that criticism of the politician too often is emotional rather than scientific. He advised that the politician is not to be shunned "as a bearer of contagion." To work with him, he said, is to gain his knowledge of human processes coupled with professional information, and to learn that the education of the public is not to be gained by ex cathedra professional pronouncements, not even with respect to fluoridation.

He thought it unfortunate that the scientist, having gained some knowledge of the atom, is led to the assumption that he knows everything, because his public and political influence suffers thereby. He recalled that Einstein, asked why men can diagnose the atom and yet fail to

ABEL WOLMAN, DR. ENG., chairman, 1958 National Health Forum Committee

HON. FRANK C. MOORE, president, Government Affairs Foundation, and co-chairman, 1958 National Health Forum Committee

NORMIS C. ANDREWS, planning director, New Haven City Plan Commission, Conn.

ARTHUR W. BROMAGE, PH.D., professor of political science, University of Michigan

ORVIN W. CAMPBELL, county manager, Miami-Dade County, Fla.

ROBERT C. COOK, director, Population Reference Bureau

JOHN B. DIBELER, director of education, American Cancer Society, Philadelphia Chapter

RUDOLPH H. FREDERICH, D.D.S., secretary, Council on Dental Health, American Dental Association

LUTHER GULICK, PH.D., president, Institute of Public Administration

JACK HALDEMAN, M.D., chief, Division of Hospital and Medical Facilities, Bureau of Medical Services, Public Health Service

REGINALD R. ISAACS, chairman, Department of City and Regional Planning, Harvard University

MRS. LUCILE PETRY LEONE, chief nurse officer, Public Health Service

HON. ROBERT B. MEYNER, Governor of New Jersey

SEWALL MILLIKEN, assistant professor, department of public health, Yale University

DAVID E. PRICE, M.D., chief, Bureau of State Services, Public Health Service

understand politics, answered, "Politics are more difficult than physics."

The total theme of the forum, he concluded, is that growth creates problems. In their specific aspects, these manifestations of growth appeared to him as:

- Countywide planning, illustrated by Cleveland's hospital service.

- Citizen participation, illustrated by events reported in Philadelphia.

- Responsibility to displaced populations, exemplified in the Eastwick hearing in Philadelphia and events in New Haven, Conn., and Nashville, Tenn.

- Consultation among planners, exemplified by the forum itself.

- Efforts to provide the entire metropolitan area with services usually found ordinarily only

some areas, and growing thinner each year as the population most in need of health services (the very young and very old) increases.

Staffing and financing of local health services are considerably more difficult in health departments serving populations of under 100,000 than in large cities.

In such places, either additional staff and funds, or a major realignment of duties of personnel presently employed, or a change in the basic role of the health department is needed, he said. "Which—or which combination—shall it be?" he asked. "What more functional areas can be defined as a suitable geographic base for health services?"

Jurisdictional Autonomy

Several speakers observed that the main difficulty in pursuing a governmental solution to the intensified needs of metropolitan residents is to see that federation does not in any way infringe upon the identities of existing local units. Stepping up State action, Bromage suggested, is the quickest means of making metropolitan government possible. "Metropolitan councils arising out of interstate compact and crossing State boundaries," he said, "are not beyond the realm of possibility."

One means of effective compromise was suggested by Moore: a metropolitan council that would be assigned only metropolitan matters. The local units would be responsible for their normal, nonmetropolitan activities, as in the Toronto plan.

"The first step towards determining the form of government required to meet our needs," Moore said, "is to define the kind of urban community we want." The decision on this matter, he feels, is primarily a local one. It must be appraised on the basis of the probable effects of the dispersal of industry, automation, nuclear energy, wider distribution of natural gas and oil, Federal highways, changes in marketing and distributing, standards of living, and longevity. "There is no need," he cautioned, "to seek uniformity in the forms and patterns of government in all great urban areas: diversity is still desirable."

Past attempts to solve metropolitan problems, Moore argued, have usually been directed

not against the total need but to some fragment of special interest. Such efforts have generally failed to produce important results. Piecemeal attacks, moreover, have frequently resulted in the creation of public authorities and special districts. If pursued generally, he said, "this could be the route to destruction of local government and popular control as we know it."

Dibeler considered decentralization of health agency operations through the development of volunteer neighborhood organizations a means of providing solutions for some of the health problems created by urban sprawl.

The newly burgeoning communities, Dibeler pointed out, lack solidarity and suffer from absentee leadership, since many of the residents are employed in nearby cities, making it difficult for anyone to organize them into a health-conscious community.

The city health officer is in no less of a predicament. Neighborhoods catering to one class of people, structured according to a relatively stable age-sex pattern, explode and disappear. In their place is another group of people. "The problems of providing health services and health education here," Dibeler said, "are increased by the introduction of new groups whose culture is not well understood and among whom there is often little identifiable leadership. Problems of communication are increased by language barriers and varying culture."

Local Solutions

In combating the effects produced by outmoded institutions several governments, on different levels, have initiated or contemplated means of developing new methods and new institutions.

In New Haven, Conn., a regional planning organization was formed in 1948 to bring the surrounding communities closer together in function and direction. Andrews referred to the redevelopment project of the Yale University School of Medicine and its department of public health as one outcome of regional planning. Located in the first area selected for clearance and rehabilitation, the project covers 150 acres of land. Additional projects, now in

traditional local health services. One-fourth of the counties in the United States, with nearly 10 percent of the population, are still without organized local health services. Therefore, he put these questions:

Is the local health department an effective instrument for some areas but not others?

Are there circumstances so unique in the areas still without a local health department that some entirely different mechanism for the delivery of public health services will be required? If so, what should it be?

Are other community resources already pro-

viding, in an acceptable manner, the service ordinarily supplied or arranged for by the health department?

What kind of studies should be undertaken to supply the missing links in our information?

Concern with patterns of health services for the near future is not confined to counties presently without local health departments, he added. Many, many more have only fragmentary service that in no sense meets the health needs of today.

Because of limitations in staff and financial resources, the coverage of service is thin in

Canons of Aesthetics

Some noted American planners and architects appear to me to be on the wrong track. They are so enamored of old cities that they even like "quaint" slums and can see nothing but ugliness in any modern city. So hostile to any apartment are they that they criticize any high-rise multiple dwelling; and so in love with the open land that they want nothing but cottages scattered through the countryside. All such canons of aesthetic value and beauty have the total weakness of ignoring not only relativity and the influence of the total environment, but of flying in the face of human need, denying satisfying classical illustrations, and failing to give any sanction to functional beauty.

The British *Architectural Review* group starts quite differently with the "stratified environment," that is, with relativity, and seeks the canons of beauty first by finding for each defined major type, or stratum, of land settlement its appropriate style of development and the appurtenances which will give it "unity." As they say in the December 1956 issue, "There is a 'town' way and a 'country' way and a 'wild' way of doing everything, and to confuse them is to ruin any hope of integrity from the beginning." It is this unity and integrity, type for type, which they find aesthetically right.

On the basis of British land uses and needs, they then classify all of England into five divisions, or types, for practical purposes: wild, country, arcadia,

town, and metropolis; with two added special divisions, rural industry and major roadways.

For each of these types of land use these British architects and planners then seek the appropriate "way" and design, "cutting out useless verticals." The third step is to fit everything together with the minimum waste of space, a principle of economy for each type. Then finally, they say, "the residue must be camouflaged, and made one with the surrounding landscape."

With this approach, one can see why the same high building or solidly paved square will be beautiful in a city, but ugly in a rural setting; why even advertising signs may not be offensive in a business district; why large "natural" open spaces are no addition to a city center; and why a Cotswold cottage may be beautiful in the country, but absurd as a comfort station in a city park.

On the aesthetic side, it seems to me, the British, and a few American architects, like Neutra and Walker, have found the answer to the question. "What's so 'bad' about urban sprawl?" The thing that is "bad," is that in the "sprawl" regions we are mixing several incompatible types of land development, thus finding ourselves, without confinement, in a series of conflicting and unreconcilable categories each of which should be subject to its own appropriate canons of beauty.

—LUTHER GULICK, president, *Institute of Public Administration*, in an address to the American Association for the Advancement of Science, December 27, 1957.

Family care programs, community mental health services, and stream pollution control are matters for cooperation among neighboring municipalities and for action at the county level of government. On the interstate level, water and air pollution problems may be solved. At the present time, New York, Connecticut, and New Jersey have an Interstate Sanitation Commission for the control of water pollution affecting those States. On the Federal level of government, or Federal-State level, are such matters as hospital construction and the control of epidemics. The recent efforts in the Asian influenza epidemic and the Hill-Burton Act are evidence for this kind of cooperation.

"There are relatively few eventualities that do not engage the attention of more than one isolated agency," the Governor said. As an example, he showed how six State departments participated in the establishment of a program for New Jersey's senior citizens. The agencies concerned were: the New Jersey Department of Health (chronic illness and needs of the aging); Department of Institutions and Agencies (public assistance, institutional care, and hospital and nursing home supervision); Department of Labor (employment service and rehabilitation); Department of Education (adult education); Department of Conservation and Economic Development (recreation and housing); and the State Treasury (pensions and other financial needs).

Effects on Nursing

Leone reported on trends of staffing hospitals with nurses as urban centers expand. In 388 small communities that built new hospitals between 1947 and 1954, 2 out of every 5 professional nurses employed there came out of retirement. Many other nurses, Leone said, who had been working on other locations came back to live in their own hometowns when the new employment opportunities developed.

The turnover of nurses in suburban hospitals is somewhat less than in urban centers, she said. While the first problem of suburban hospitals is to recruit nurses, once they are recruited they tend to stay in their jobs longer than nurses employed in downtown hospitals. In getting to

their jobs, they prefer not to travel through a downtown area each day to a suburb.

In a study of 1 suburban hospital in Arlington, Va., 2 in Maryland, and the new Washington Hospital Center in the District of Columbia, Leone found that only in Arlington was there a shortage of nurses. "Factors exerting a favorable influence on the acquisition of nurses," Leone said, "were (a) pay increase, (b) aggressive campaign for nurses, (c) newness of hospital and availability of parking space, and (d) need of married nurses to supplement their husbands' incomes. Unfavorable factors were (a) poor location with regard to bus service, (b) lack of school of nursing in the hospital, and (c) low pay."

In order to give adequate service to the mushrooming population, the Arlington Hospital, with its shortage of nurses, makes use of trained aides, clerks, and volunteers.

Effects on Dentistry

Frederich, citing the 1956 survey of dental practice conducted by the bureau of economic research and statistics of the American Dental Association, pointed out that dental care is significantly more available in the suburban business area than in other areas. The urban downtown area follows close behind and slightly ahead of the urban neighborhood area, and the suburban and urban residential areas drop off markedly in availability of dental care.

What are the factors influencing this distribution of dentists? "Established practitioners," Frederich said, "are reluctant to relocate their practices until the inconvenience of their location to patients who have moved away is reflected in pressures from those patients. The choice of a new location is then made between the outlying suburban business district (or neighborhood business district) and the downtown area of the city. The dentist's decision will depend on whether he will follow the family practice into localities where his patients have moved or whether he will make himself convenient to the wage earner who prefers to obtain his dental care near his business location."

"The younger dentists," Frederich said, "tend to locate their practices in newer but established suburban areas which have a higher child

the Federal review or planning stage, are integral parts of a renewal and rehabilitation program. At the same time, the planning organization is developing plans for the protection of sound residential areas which will involve extensive housing inspection and neighborhood studies to insure that environmental conditions adversely affecting the neighborhoods do not develop. "The New Haven program," Andrews observed, "is the result of a combination of strong leadership, active citizen participation, and soundly conceived technical assistance."

In 1957, the Miami-Dade County complex

adopted a charter that, according to Campbell, "for the first time in America established a legal entity designed to handle the entire metropolitan situation through an agency given full responsibility for control of local affairs."

"Where we confront problems that defy boundary lines," Governor Meyner said, "we can develop regional cooperation. And this can be done in health services as it has been done in public education."

Governor Meyner pointed out specific problems that can be best handled through cooperative efforts of different levels of government.

Septic Tank Suburbia

We seem to be on the way to creating a septic tank suburban civilization—a maze of septic tank suburbias. We are doing this because we are now repeating, at least in principle, the mistakes which we formerly permitted in our cities and which we are now spending billions of dollars to correct.

What is happening is, of course, a part of a great transformation—call it explosion—that is taking place in our living patterns.

Because our cities grew painlessly and, in any case, were unfit to handle our automobile way of life, people have been beating it out to the country. At least it once was the countryside. It isn't anymore. The green fields and the old swimming pond have been replaced by hotdog stands, filling stations, superhighways, highway intersections, airports, outdoor movies, indoor skating rinks, and shopping centers. These things have their place, but usually they are in the wrong place.

There isn't a plan, or what plans there are aren't being implemented in relation to the whole. So a few years from now we will be faced with demands for the expenditure of more dollars to straighten out the mess. And when I say "we" I mean the taxpayers.

No one can say we haven't been warned. And no one will be able to blame Uncle Sam. Uncle Sam isn't in any position to police an expanding (or exploding) metropolitan area any more than he can

exercise police or zoning powers in a municipality. And no one wants him to.

What Uncle Sam can do (and has been doing), however, is to fly a warning flag about the growth of septic tank civilization and relate it to the larger problem: the grave need for planning on a metropolitan scale and for action to follow that planning.

The blunt truth is that without effective planning most human enterprises go bankrupt.

One of the tools available to us is the urban planning assistance program, otherwise known as section 701 of the Housing Act of 1954.

Section 701, among other things, authorizes Federal financial aid on a matching basis to official State, metropolitan, or regional planning agencies for the planning of metropolitan and other urban regions.

Some 40 areas are now participating. Others are applying. However, the resources available to section 701 stretch only so far; what I say on this score must not be taken as an open invitation.

What I want to underscore is that *planning* by itself, no matter on how big a scale, is not enough. Plans may be wonderful; they can be supported by bales of statistics and illustrated maps and charts. But something more is necessary to give them meaning.

The plans must be acted on, and the primary responsibility for this lies with the citizens of the regions involved. To put it in the bluntest terms, the money they save will be their own.

—ALBERT M. COLE, *U. S. Housing Administrator*, excerpts from an address to the annual meeting of the *Prefabricated Home Manufacturers' Institute*, Boca Raton, Fla., March 19, 1958.

Mortality in the 1957-58 Influenza Epidemic

CARL C. DAUER, M.D.

OUTBREAKS of A-prime influenza had scarcely subsided in the United States and Europe late in the spring of 1957 when it was reported that an epidemic of influenza had broken out in Hong Kong about the first part of April. Confirmation that a new strain of type A influenza virus, now referred to as the "Asian" strain, was causing the disease was obtained by the third week of May. The disease was reported to be mild and to have a low mortality, although reports from Manila indicated that the number of deaths from all causes was higher than usual in that city.

Introduction of the new strain of virus into the United States from the Far East probably took place by the last of May 1957, and the first outbreak identified as due to "Asian" influenza began early in June in Newport, R. I. During the summer, the disease in the United States was characterized by a series of localized epidemics, some of them interrelated, in closed groups of teen-age children and young adults. Undoubtedly, dispersal of members of some affected groups to various parts of the country served to seed the population extensively before the end of the summer. During this period, deaths attributed to influenza were few, and the mortality rate from influenza and pneumonia was not higher than expected.

One communitywide epidemic of influenza occurred in Louisiana late in August. In September, when schools in most parts of the coun-

try opened, explosive epidemics began first in high schools and colleges and immediately thereafter in elementary school populations and in preschool children. Incidence in adults was not excessively high. The peak of the epidemic was reached in the third week of October, after which incidence declined throughout November and December. During January, February, and March, the occurrence of influenza was characterized by numerous localized outbreaks, principally in school and other institutional populations.

During the height of the epidemic in October, respiratory disease rates as estimated by the U. S. National Health Survey were about 111 per 1,000 persons per week in the age group 5 to 19 years, 28 per 1,000 under 5 years, 16 per 1,000 in the group aged 20 to 64 years, and about 9 per 1,000 in persons 65 years of age and over.

Data from two sources show the effect of the influenza epidemic on mortality: the numbers of deaths credited to influenza and pneumonia in 108 large cities, reported weekly to the National Office of Vital Statistics, Public Health Service; and the Current Mortality Sample, consisting of a 10 percent sample of all death certificates filed in State departments of health, copies of which are sent each month to the National Office of Vital Statistics (1, 2). These data are provisional; final figures will be available in early 1959.

Influenza and Pneumonia Deaths in 108 Cities

Influenza and pneumonia deaths reported each week from September 1 to March 29 are shown in figure 1 with the 3-year median fig-

Dr. Dauer is medical adviser in the National Office of Vital Statistics of the Public Health Service. Assistance in preparing this report was given by Anne E. Sebastian and Sylvia Osato of the Office's Mortality Analysis Section.

population and a higher level of dental health education than other areas. The dentist is thus able to establish himself more quickly and develop a stable family dental practice, convenient to a highly desirable living environment for his family and himself."

The trends in distribution of dental specialists, he said, are consistent with the distribution of general practitioners. Orthodontists have shown a decided preference for localities with large populations of children and accessibility to good transportation. Frequency of visits and relatively short appointments are not compatible with difficulty of access to the office or inconvenience in transportation.

Oral surgeons tend to occupy central locations with easy access to large numbers of people. They also consider the accessibility of hospitals for the management of the more serious problems.

In the newer trends of distribution of dental services, Frederick observed, there are specific ramifications for those who purchase dental care through personal budget payments (purchase is made through a credit agency) and group purchase plans, and for the indigent.

The budget payment plans, which operate best through centralized administration of its professional and economic aspects, are faced with certain problems imposed by a sprawling population over a wide geographic area, sometimes reaching over State lines.

"As group purchase plans develop and expand, it is reasonable to anticipate that dentists will be attracted to the areas where people covered by such plans live. For access to these plans tends to raise the dental health education of their members and increases their desire to avail themselves of dental care," he said.

The most serious problem that can be expected to develop, according to Frederick, will be in the operation of public assistance welfare programs for dental care. It is reasonable to assume that the suburban shift contains a high percentage of the self-sustaining population, thus resulting in a concentration of lower income and indigent population in the urban area.

If the trend toward the centralization of dental practices in suburban business centers, urban downtown, and neighborhood business areas continues, there will be fewer dentists

available to meet the needs of an expected expanding public assistance welfare health program. To compound this difficulty are the general lack of funds to support the costs of such programs of dental care, particularly for children, and the relatively low level of dental health education of the group. If these conditions are reversed, it seems reasonable to predict that dentists will locate their practices where the demand for care exists, he said.

The changing distribution of population will also have an effect on the special problems of providing dental care to special disease groups. "Certainly," Frederick concluded, "the expansion of the concept of the hospital as a community health center, where all aspects of health care are made available, will have an effect on dental practice."

Conclusion

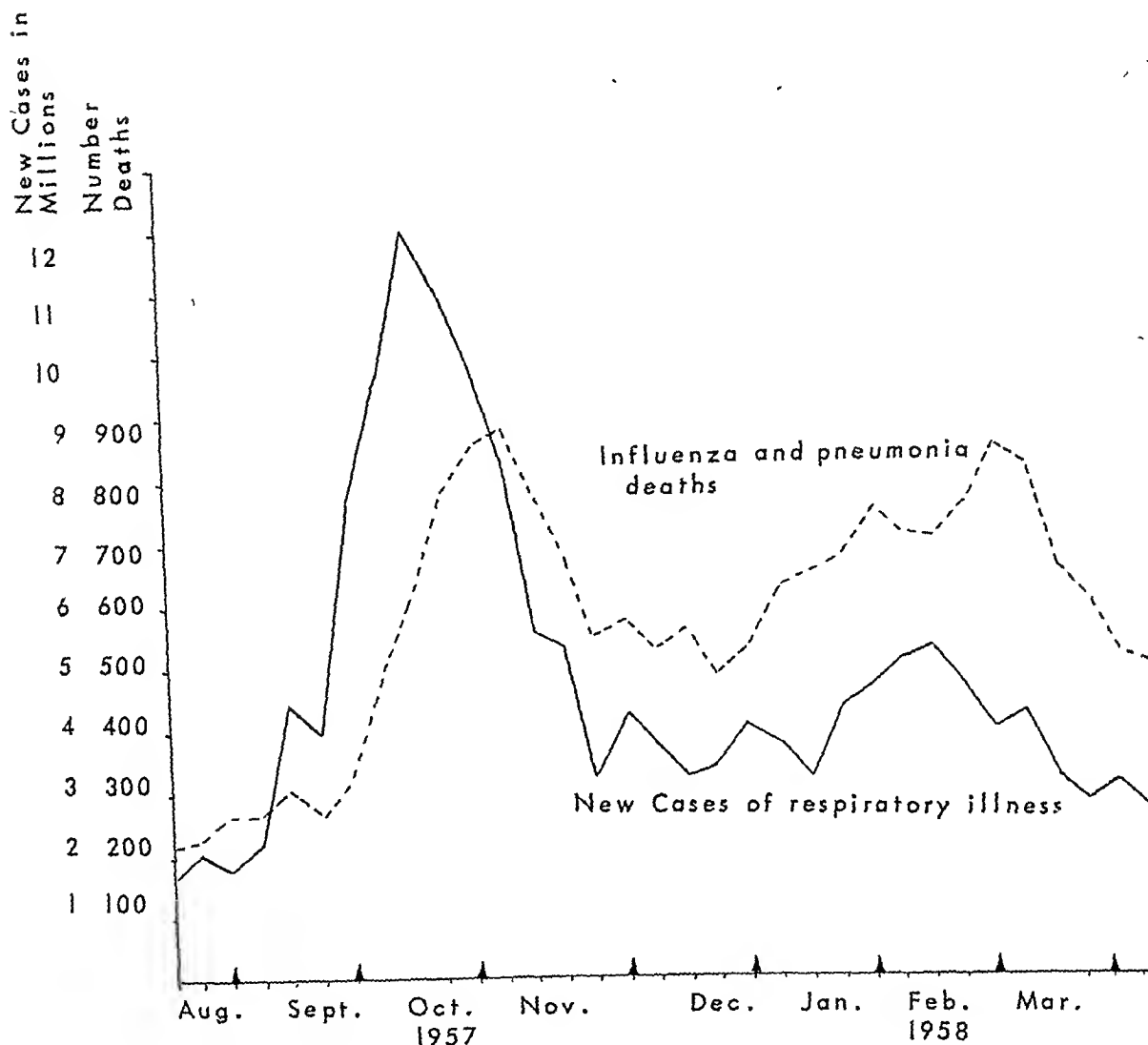
In 20 short years, Price said, the health of three-fourths of the entire population of the United States will depend upon how well we manage metropolitan services. What kind of air will we be breathing in 1980? he asked. What kind of water will we drink? We are already finding it hard to produce the 200 billion gallons of acceptable water which farms, industries, and cities require daily, he said. How are we going to provide 350 billion gallons a day by 1975?

From now on, Gnlick said, most Americans will be born, grow up, live, work, and die in great metropolitan complexes. From now on we are an urbanized community. And something more than the expansion or adumbration of present facilities is needed, he observed. "Improved and expanded water supplies and sewer lines, wider streets, or better housing are excellent ideas, but," Gnlick pointed out, "the real things we need are brains, character, drive, organization, and leadership."

Only leadership, Milliken agreed, can reach across the lines of jurisdictions and assist in bringing about cooperative action.

To these remarks, Price added: "Imagination, creativity, minds that can cut through the cobwebs of long-established procedure and find the new method that does the job faster and cheaper—these are the keys to public health progress."

Figure 2. Estimated numbers of new cases of respiratory illnesses¹ and numbers of deaths from influenza and pneumonia, in 108 large cities, by week.



¹ U. S. National Health Survey estimates.

tional Health Survey and the numbers of deaths from influenza and pneumonia reported in 108 cities are shown in figure 2. As would be expected, morbidity rates from respiratory disease began to rise about 3 weeks before there was any apparent rise in mortality from influenza and pneumonia in the large cities. The peak in morbidity was also reached about 3 weeks prior to that for mortality. However, the second rise in mortality was not preceded by any rise in incidence of cases of respiratory disease. As a matter of fact, no rise in incidence was apparent until about 4 weeks after

the beginning of the secondary rise in mortality, and that increase in incidence was moderate.

During the fall of 1957, deaths from influenza and pneumonia were above expected levels in the cities of all regions, but the excess was less pronounced in the West South Central, Mountain, and Pacific groups of cities. Such geographic variations have been common in previous epidemics. The second rise in mortality during January, February, and March 1958 was greater in the East North Central and West South Central cities. It was smaller in the West North Central and South Atlantic,

ures for 1954-56. These data show that mortality rose well above expected figures and reached a peak early in November, receding in December and early January 1958 to a level which remained above normal expectancy in December and early January. Another rise in mortality began about the middle of January; it reached a peak about the first of March.

There was a remarkable similarity in the trends of mortality from influenza and pneumonia in the 108 cities of the United States and the 160 large towns of England and Wales as reported in the Weekly Influenza Statement issued by the British Ministry of Health (fig. 1). In both countries, there were two peaks of mortality, but the early peak in the United States was reached 4 weeks later than in Great Britain. If the data are plotted so

that the early peaks in each country are superimposed, the similarities are even more striking. Each group, for example, reached a peak in 6 weeks and declined for a similar period of time. Mortality, however, continued to rise for a longer period during the second rise in the United States.

A total of 14,470 deaths from bronchitis was also reported in England and Wales from the first of September 1957 to March 8, 1958. Whether these correspond to any of the bronchopneumonia deaths reported in the United States or some other entity is not known. There were many more such deaths in England and Wales during the second rise of mortality than from influenza and pneumonia.

The estimated numbers of new cases of upper respiratory illness reported by the U. S. Na-

Figure 1. Numbers of deaths from influenza and pneumonia reported weekly in 108 large cities in the United States and 160 large towns in England and Wales, with the median for the period 1954 through 1956.

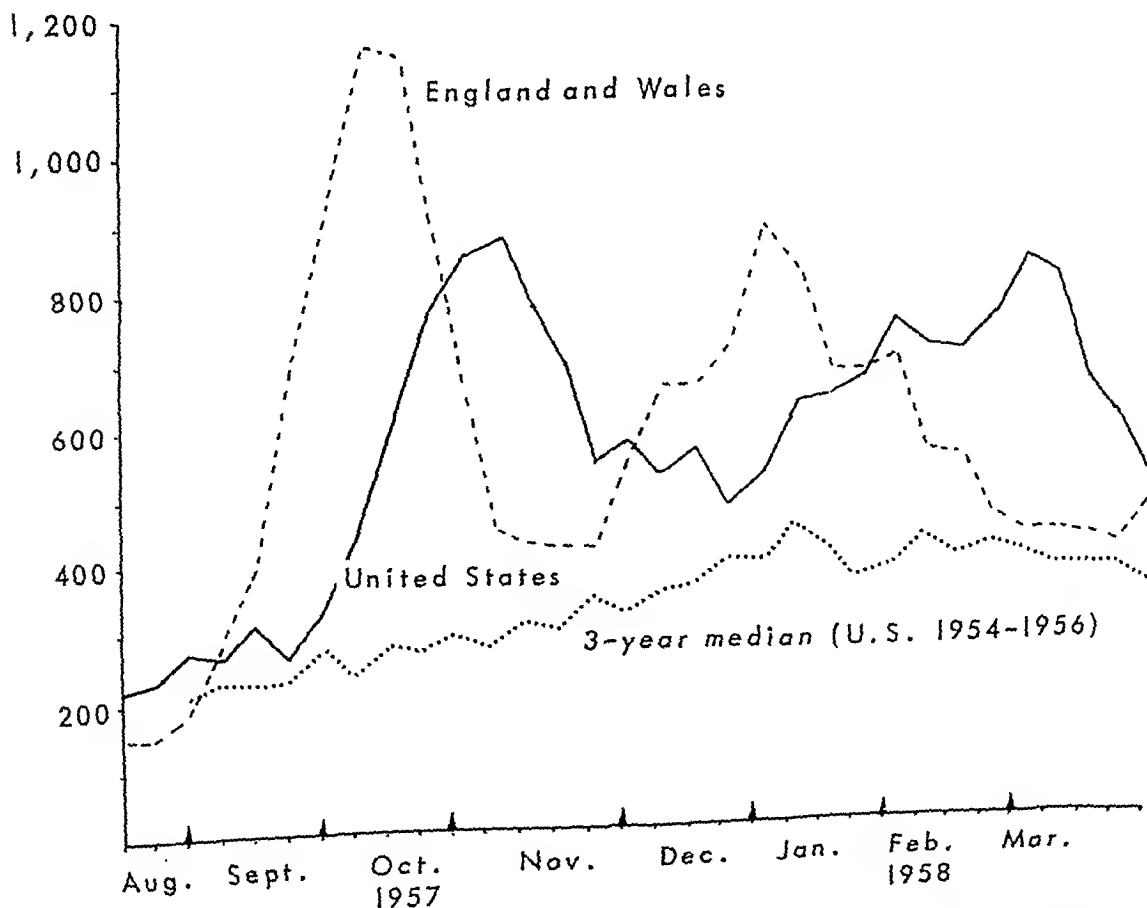
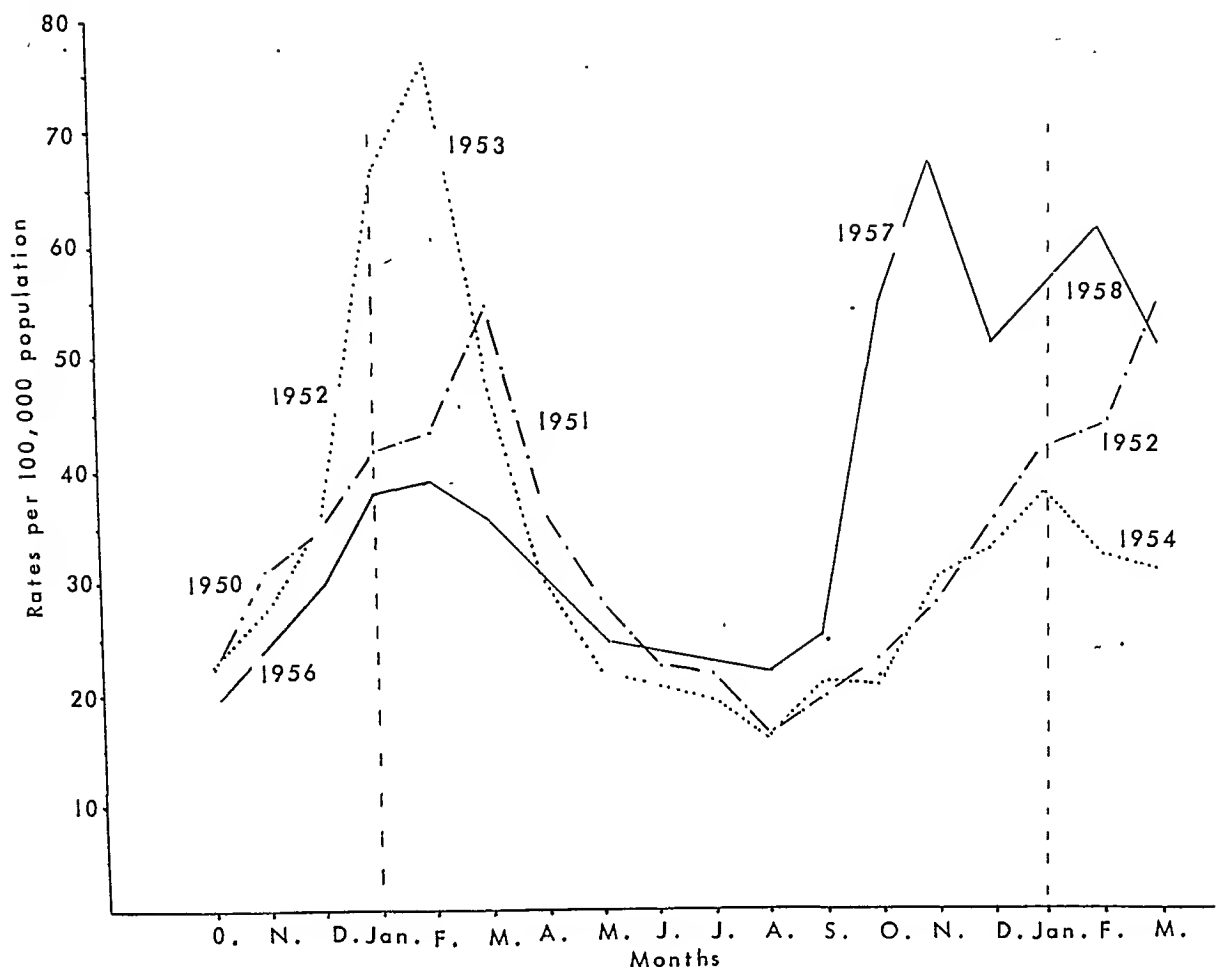


Figure 3. Estimated death rates from influenza and pneumonia, by month, 1951, 1953, and 1957.



the excess credited to this cause. In recent years, only about a quarter of the excess mortality resulting from influenza epidemics has been attributed to influenza and pneumonia.

In measuring the effects of the 1957-58 epidemic, excess mortality for the country as a whole was obtained by subtracting from the number of deaths during the period September 1957 to March 1958, those reported during the comparable period in the previous year. The 1956-57 period was considered normal because there was little influenza and the numbers of deaths reported were not greatly different from the 3-year (1954-56) mean and median numbers.

Since increases in mortality during influenza epidemics of the past decade or two have not been solely caused by influenza and pneumonia,

data showing excess mortality from other causes are included. The estimated numbers for these categories are shown in table 1 by months from September 1957 through March 1958, and, for comparison, the estimated numbers for the previous year are given as well. The differences between the data for the two periods are shown in table 2. In the same table, these differences or excesses are also expressed as the excess number of deaths per 100,000 population for each month. They should not be confused with mortality rates for the various categories.

The excess mortality for the country as a whole as well as numbers of influenza and pneumonia deaths for the cities occurred in two phases or "waves." The first rose and fell with the explosive epidemic in September, Oc-

and was absent in the Mountain and Pacific cities. In two areas, the East and West South Central, the numbers of deaths from influenza and pneumonia in January and February 1958 equaled or exceeded those reported in October and November 1957. There were equally wide variations from city to city within most of the geographic divisions, that is, some cities reported more than the number of expected deaths from influenza and pneumonia in the fall, some during the winter, and others had significant increases in both the fall and the winter.

Mortality in the Nation

When mortality rates from influenza and pneumonia in the 1957-58 epidemic are compared with those for certain other recent epidemics, it is found that the death rates in 1957-58 were not excessively high, as shown in figure 3. The peak in the 1953 epidemic was reached in February when the mortality rate from influenza and pneumonia was 75.9 per 100,000 population, and in 1951 the peak was reached in March with a rate of 59.8. The peak in 1957-58 was reached in November when the rate was 66.6 or about midway between 1951 and 1953. In 1943, the peak month was

February when the death rate from influenza and pneumonia was 94 per 100,000 population. However, the period of increased mortality extended over a longer period of time in 1957-58—about 6 months, compared with the usual 3 to 4 months.

Excess Mortality

The number of deaths above that expected during a nonepidemic period, or the excess mortality, has been used by Collins to measure the effects of epidemics of influenza (3, 4). He has used this method since approximately 1930 to measure the size of epidemics and has shown that 21 separate ones have occurred since 1918-19. By using data from selected cities, Collins showed that excess mortality from influenza and pneumonia in these cities amounted to 99.3 per 100,000 population in 1920, 44.4 in 1928-29, 18.4 in 1936-37, 14.4 in 1943, 3.8 in 1951, and 6.9 in 1953. He also demonstrated that during influenza epidemics there had been an excess in mortality from causes other than influenza and pneumonia. This excess was mainly from cardiovascular diseases. Since 1918 when about 95 percent of the excess mortality was credited to influenza and pneumonia, there has been a gradual decrease in the proportion of

Table 1. Estimated number of deaths by cause for each month from September 1957 through March 1958 compared with estimates for that month in 1956-57

| Month and year | All causes | Cardio-vascular diseases | Influenza and pneumonia | All other causes |
|---------------------|------------|--------------------------|-------------------------|------------------|
| September.....{1957 | 123, 370 | 64, 680 | 3, 430 | 55, 260 |
|{1956 | 118, 280 | 62, 060 | 2, 610 | 53, 610 |
| October.....{1957 | 150, 390 | 78, 800 | 7, 860 | 63, 730 |
|{1956 | 131, 610 | 69, 330 | 3, 430 | 58, 850 |
| November.....{1957 | 145, 170 | 75, 560 | 9, 280 | 60, 330 |
|{1956 | 129, 070 | 70, 130 | 3, 990 | 54, 950 |
| December.....{1957 | 152, 060 | 81, 690 | 7, 400 | 62, 970 |
|{1956 | 138, 520 | 74, 360 | 4, 760 | 59, 100 |
| January.....{1958 | 153, 190 | 84, 960 | 7, 680 | 60, 550 |
|{1957 | 146, 380 | 81, 240 | 5, 410 | 59, 730 |
| February.....{1958 | 143, 030 | 80, 750 | 7, 850 | 54, 430 |
|{1957 | 127, 600 | 69, 340 | 5, 010 | 53, 250 |
| March.....{1958 | 144, 800 | 78, 950 | 7, 210 | 59, 110 |
|{1957 | 142, 510 | 77, 920 | 5, 210 | 59, 380 |

Table 4. Excess mortality by age, September 1957 through March 1958

| Age (years) | September-December 1957 | | January-March 1958 | | Total excess per 100,000 population |
|------------------|-------------------------|-------------------------------|--------------------|-------------------------------|-------------------------------------|
| | Excess number | Excess per 100,000 population | Excess number | Excess per 100,000 population | |
| Under 1..... | 1,670 | 44.0 | 490 | 12.9 | 56.9 |
| 1-14..... | 2,270 | 4.7 | 650 | 1.4 | 6.1 |
| 15-24..... | 490 | 2.2 | 150 | .7 | 2.9 |
| 25-34..... | 1,410 | 5.9 | -430 | -1.8 | 4.1 |
| 35-44..... | 1,416 | 6.2 | 420 | 1.8 | 8.0 |
| 45-54..... | 3,240 | 16.4 | 2,410 | 12.2 | 28.6 |
| 55-64..... | 7,500 | 50.2 | 3,760 | 25.1 | 75.3 |
| 65-74..... | 15,220 | 156.5 | 6,890 | 70.7 | 227.2 |
| 75 and over..... | 20,310 | 405.2 | 10,010 | 199.7 | 604.9 |

Age Distribution of Deaths

The age distribution of deaths from influenza and pneumonia is available for the last 5 months of 1957. These have been compared with those for a similar period of 1956 (see table 3). These data show that, while all age groups experienced some increase in mortality rates, the highest rate per 100,000 population was in the very young age group under 1 year, and in persons 65 years of age and over. There was a greater percentage increase in the rates in the age groups from 1 to 64 years, but this was not sufficient to change the contour of the curve of influenza and pneumonia mortality seen in recent epidemics.

The numbers of deaths by age groups in excess of those for the previous year are shown for all causes in table 4. Two periods of time, corresponding to the two phases of the influenza epidemic, are shown. The excess is also expressed as the number of deaths per 100,000 population above that for the previous year. These data show that 80 percent of the excess deaths from September to December, inclusive, occurred among persons above the age of 54 years. From January to March, inclusive, the proportion was 85 percent for the same age group. The proportions of the excess which occurred in infants were 3 and 2 percent, respectively, for the two periods of time. These data point up the vulnerability of persons in the older age groups during the recent influenza epidemic. The excess mor-

tality in infants was relatively small and, in children and young adults, slight.

Discussion

The recent epidemic caused by the Asian strain of type A influenza virus appears to have been similar to the 1918-19 epidemic with respect to its seasonal occurrence. Both were characterized by localized outbreaks prior to the explosive type of infection early in the fall. Both were milder in the following winter months.

The recent epidemic differed from that of 1918-19 in that mortality this time was lower; most of the excess deaths were credited to cardiovascular disease, and deaths were relatively more common in older persons, in contrast with high mortality principally from influenza and pneumonia in young adults in 1918-19.

The epidemic of "Asian" influenza was similar in most respects to others caused by the A-prime strains during the past decade in which mortality was not excessively high; most of the excess deaths occurred in older persons; and a large proportion of excess deaths was credited to cardiovascular diseases. However, the 1957-58 epidemic differed in that the main or explosive part occurred early in the fall rather than in the winter, it was preceded by a series of localized outbreaks, and it was followed by a secondary rise in mortality with little evidence of widespread infection.

The very large excess in numbers of deaths

Table 2. Excess number of deaths by cause from September 1957 through March 1958 as compared with comparable periods in 1956-57

| Month | All causes | | Cardiovascular diseases | | Influenza and pneumonia | | All other causes | |
|----------------|------------|-------------------|-------------------------|-------------------|-------------------------|-------------------|------------------|-------------------|
| | Number | Rate ¹ | Number | Rate ¹ | Number | Rate ¹ | Number | Rate ¹ |
| September..... | 5,090 | 2.9 | 2,620 | 1.5 | 820 | 0.5 | 1,650 | 1.0 |
| October..... | 18,780 | 10.9 | 9,470 | 5.5 | 4,430 | 2.6 | 4,880 | 2.8 |
| November..... | 16,100 | 9.3 | 5,430 | 3.2 | 5,290 | 3.0 | 5,380 | 3.1 |
| December..... | 13,540 | 7.8 | 7,330 | 4.2 | 2,640 | 1.5 | 3,570 | 2.1 |
| January..... | 6,810 | 3.9 | 3,720 | 2.2 | 2,270 | 1.3 | 820 | .5 |
| February..... | 15,430 | 8.9 | 11,410 | 6.6 | 2,840 | 1.6 | 1,180 | .7 |
| March..... | 2,290 | 1.3 | 536 | .3 | 2,000 | 1.2 | -240 | -.1 |

¹ Excess number per 100,000 population.

tober, and November 1957, and the second occurred in January, February, and March 1958 during a period of localized outbreaks, mainly in schools and institutional populations.

The greatest excess mortality from all causes occurred in October 1957, when incidence of respiratory illness was at its height. This was due mainly to the fact that deaths from cardiovascular diseases were excessively high. On the other hand, the greatest excess in influenza and pneumonia deaths occurred in November, coinciding with the peak in numbers of deaths from this cause reported by the 108 large cities. During this same period, excess deaths from causes other than cardiovascular diseases and influenza and pneumonia were highest.

Mortality during the second phase, during January, February, and March 1958, rose to a high level principally in the category of cardiovascular diseases. In February, the excess

number for this disease category was 22 percent above the excess for the preceding October, while excess deaths from influenza were well below those reported in November. Deaths from all other causes were also well below the level reached in November.

While excess mortality from all causes during the last 4 months of 1957 amounted to 53,510 deaths, the effect on the general death rate of the United States was not striking. The provisional crude rate for 1957 was 9.6 based on the 10 percent sample of deaths as compared with 9.4 in 1956, or an increase of 2.1 percent. If the excess number of deaths during the last 4 months of the year were subtracted from the estimated total for 1957, the rate would have been about 9.3 per 1,000 which would have been lower than that for the previous year.

Table 3. Estimated death rates for influenza and pneumonia, by age group, for the period August through December in 1957 and in 1956

| | All ages | Under 1 year | 1-24 years | 25-44 years | 45-64 years | 65 and over |
|----------------|----------|--------------|------------|-------------|-------------|-------------|
| <i>1957</i> | | | | | | |
| August..... | 21.6 | 161.5 | 3.3 | 1.3 | 15.0 | 140.5 |
| September..... | 24.6 | 179.5 | 5.9 | 4.2 | 17.2 | 155.1 |
| October..... | 53.3 | 274.1 | 16.8 | 19.4 | 19.7 | 294.1 |
| November..... | 66.6 | 321.0 | 13.7 | 18.2 | 63.3 | 101.6 |
| December..... | 50.2 | 377.6 | 12.3 | 11.6 | 43.3 | 290.0 |
| <i>1956</i> | | | | | | |
| August..... | 19.8 | 97.0 | 4.0 | 2.5 | 16.0 | 111.8 |
| September..... | 19.2 | 130.3 | 3.6 | 3.1 | 15.1 | 125.3 |
| October..... | 23.8 | 217.3 | 5.1 | 3.0 | 11.9 | 153.5 |
| November..... | 29.2 | 250.6 | 4.4 | 6.8 | 16.1 | 189.7 |
| December..... | 33.8 | 310.1 | 8.2 | 5.1 | 22.1 | 190.1 |

Despite both administrative and technical difficulties, public health officials have many resources to draw upon as they move to limit damage to the Nation's health by nuclear radiations.

Administrative Aspects of Nuclear Energy

E. C. ANDERSON, M.S.

THE PUBLIC HEALTH administrator looking at nuclear energy finds himself confronted with some unique problems. Some of these stem from the nature of radiation and its biological effects, and some from existing professional, administrative, and legal relationships, over which he has little control.

One unique aspect of radiation protection is that it presents an opportunity, if not a necessity, to develop special practical preventive measures beforehand, in anticipation of contamination, to prevent serious exposures of large populations. In the past, public health has been permitted to indulge in occasional lapses. The results of its failures have often inspired greater and stronger preventive measures. With respect to radiation, however, the penalty may be irrevocable and possibly final.

Nature of Radiation Hazards

There are both an abundance of data and a complete lack of assurance as to the nature and sources of the health hazards of radiation associated with nuclear energy, with the operation and products of nuclear reactors. While the precise biological effects of radiation are as yet uncertain, the current scientific consensus is that any dose of radiation is harmful to some

degree. Therefore, any unnecessary exposure should be avoided. In other words, doses should be kept at a minimum, consistent with the benefit that will be gained from radiation.

A second general premise is that damage is irreversible and cumulative. Hence, all sources of exposure of individuals or populations must be considered, irrespective of their nature. Related to this aspect is the difference between two types of exposure: external, which results primarily from gamma and X-rays, and internal, from ingested or inhaled radioactive materials.

Also to be considered are two general types of effects: the short-term, acute effect that one normally associates with high dose rates resulting from an accident or a weapon; and the long-term, cumulative effect of low-level doses, usually associated with normal, civilian uses of nuclear energy but including even those slight but chronic doses associated with the widespread fallout from weapons testing.

Sources of Radiation

For complete perspective on nuclear energy, the administrator first needs to look at all the sources of radiation.

Everyone is and always has been exposed to natural background radiation. This radiation varies with geographic location, elevation, and other factors and includes both internal (natural radium, radioactive potassium, breathed radon and thoron, for example) and external

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from all causes, and, especially from cardiovascular diseases, in January, February, and March 1958 is difficult to explain. There was no evidence of widespread occurrence of influenza at that time, and excess mortality from influenza and pneumonia was small compared with that of the previous October and November. The actual number of deaths from influenza and pneumonia was 2,000 less in February 1958, the peak month, than it was in November 1957 and the number which would be expected to occur was about 1,000 more in February than in November. Consequently, the excess was relatively small for this category. Persons in the older age groups, among whom most of the deaths occurred, may have had during this period respiratory infections that were difficult to recognize, possibly the reason why the majority of the deaths were credited to cardiovascular diseases. The suggestion also has been made that many of those who died in January and February had been weakened by attacks of influenza in the fall of 1957. Since a number of deaths during the epidemic in the fall were caused by staphylococcal pneumonia, the possibility that the increase in deaths in January, February, and March was due to this infection has also been proposed. Information from certain hospital centers and mortality data do not support this hypothesis. The reason for the increase in mortality during the last part of the winter remains unexplained.

The data presented in this report indicate

very clearly that the total impact of the 1957-58 influenza epidemic on mortality cannot be approximated if only deaths credited to influenza and pneumonia are taken into consideration. The data show that the increase in the number of deaths credited to cardiovascular diseases accounts for approximately one-half of the total excess mortality. This is not surprising, since most of the deaths occurred in older persons, many of whom would be expected to have some evidence of cardiovascular pathology.

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CDC Courses in Insect and Rodent Control

Refresher training in insect and rodent control will be offered at the Communicable Disease Center, Atlanta, Ga., during September 15, 1958, through June 1959, according to the following schedule:

Insect control. September 15-26.
 Rodent control. September 29-October 10.
 Mosquito control. November 2-7.
 Biology and identification of arthropods of public health importance. January 12-23.
 Epidemiology and control of vector-borne diseases. February 16-20.
 Insect and rodent control. June 1-12.

There are no tuition or laboratory fees for the courses. Students will be accepted from State and local health departments, the Armed Forces, and other organizations concerned with insect or rodent control. Qualified students from other countries will be accepted and given opportunity to study vectors of important diseases.

Application forms may be obtained from the Chief, Training Branch, Communicable Disease Center, Public Health Service, 50 Seventh Street, NE., Atlanta 23, Ga.

restrictions on many activities and much of the information related to radiation. Whatever the reasons, AEC is issuing licenses to and establishing health and safety criteria for private industries and users falling within the scope of the Atomic Energy Act of 1954.

This situation gives rise to a number of questions. In this country, the States have as one of their constitutional powers the protection of the public health. The question has been raised as to whether the licensing activity of AEC has preempted from the States the right to exercise control over AEC licensees. This specific question may be answered by a court decision or by legislation. The Atomic Energy Commission is currently proposing an amendment to the Atomic Energy Act which would, with certain reservations, recognize the States' right to exercise their police powers over nuclear energy. In any event, at this moment the respective authority of the States and the Federal Government in the atomic energy field is not clearly defined.

At present, both Federal and State governments have an opportunity to reduce the potential hazard. From a health standpoint, it makes no difference whether ionizing radiation comes from an X-ray machine or radium under State jurisdiction or radioactive substances under the control of AEC or foreign governments. The public health agency must consider all of these sources of radiation exposure in administering a radiation control program, even though it cannot assert complete control over manmade sources of radiation. If a State has already proceeded to regulate sources of radiation within its jurisdiction, it is in a far better position to challenge other radiation sources. Meanwhile, the public must look to higher authorities also, and not only to AEC. The AEC cannot legally exercise control over sources other than special nuclear materials, byproduct materials, and utilization and production facilities. Others have responsibility related to transportation of radioactive materials, weapons tests, and naturally occurring and machine-made radiation and radionuclides.

Resources Available

The public health administrator will find that there are a number of resources available to

guide and assist in developing and carrying out a radiation protection program.

While the basic rule in radiation protection is that all unnecessary exposure to radiation should be avoided and that each exposure must be justified on the basis of benefit gained, one must also have a guide as to levels of dose and concentrations of radioactivity which call for special consideration in the light of assumed benefits. The parent group for developing recommendations on maximum permissible doses and concentrations of radioactivity in the environment is the International Commission on Radiological Protection. This body, composed of professional and scientific members from many countries, establishes basic standards and criteria which are the foundation of recommended standards, laws, and regulations.

In the United States, basic radiation protection standards are drawn up by the National Committee on Radiation Protection and Measurement, composed of representatives from a broad range of professional and scientific organizations. The committee operates through 11 subcommittees whose recommendations are published by the National Bureau of Standards. The publications of broadest interest to the public health agency are Handbook 52, Maximum Permissible Amounts of Radioisotopes in the Human Body and Maximum Permissible Concentrations in Air and Water, and Handbook 59, Permissible Dose From External Sources of Ionizing Radiation. Others of the handbooks deal with more specific subjects.

The American Standards Association has created a Nuclear Standards Board, and has established under this board seven projects dealing with various phases of nuclear energy. Of particular interest to the health professions are projects N1, Glossary of Terms in Nuclear Science and Technology; N2, General and Administrative Standards for Nuclear Energy; N3, Nuclear Instruments; N6, Reactor Hazards; and N7, Radiation Protection. To date, the Nuclear Standards Board has approved, as an American standard, the Glossary of Terms in Nuclear Science and Technology, published in 1957 by the American Society of Mechanical Engineers. No other standards have been published as yet under this board but committees are active in their development.

exposures. While not practically controllable, it contributes substantially to an individual's total lifetime exposure. It has been used as a baseline from which to compute maximum permissible doses.

Medical and dental uses of X-ray; medical, industrial, and research uses of radium and radionuclides; and industrial uses of X-ray are well-known controllable sources of radiation exposure.

The major prospective source of radioactive material and potential radiation dose, however, is the nuclear reactor. Reactors are becoming increasingly common as research tools in medical, educational, and industrial institutions and establishments. Power reactors for vessel propulsion have been installed by the Navy and are being applied to merchant vessels. The commercial power reactor at Shippingport, Pa., is now in operation, and many more power reactors are under development. We may expect a wide variety of operating reactors in and near populated centers within the next decade.

All reactors produce certain radioactive wastes. Such liquid, gaseous, and solid radioactive materials are usually treated or segregated at the reactor site or diluted in discharge. Extremely radioactive spent fuel must be isolated or removed from the reactor site for treatment at central chemical processing plants, as there is no way to reduce the radioactivity or shorten its duration. The major source of radioactivity is the fuel, which builds up radionuclides as a result of nuclear fission until fission is no longer practical and the fuel is "spent." To segregate fission products and recover fissionable fuels, spent fuel elements are processed at special plants owned by the Atomic Energy Commission and located on Federal reservations. AEC has requested proposals from private industry for the construction and operation of additional plants for chemical processing of spent fuel. Under investigation also is the possibility of continuous treatment of liquid fuels at the reactor site.

Wherever treatment is carried on, it is necessary to deal with treatment and disposition of low-level wastes; transportation of either highly radioactive spent fuel or fission products segregated from the fuel; and ultimate disposition of millions of curies of fission prod-

ucts, now mostly stored in tanks underground. To recapitulate, reactors present a special challenge to air pollution control, industrial hygiene, water pollution control, solid waste management, transportation of extremely hazardous materials, and, above all, high-level waste disposition.

In addition to the hazards related to normal reactor operation, an accident, or accidental discharge of radioactivity, could produce immediate, acute contamination of areas outside the reactor site. The accident hazard cannot be fully evaluated, for lack of experience. It is real enough, however, to be causing concern to industry, insurance companies, and Congress. The consensus seems to be that there is no danger that a reactor will produce a nuclear explosion, but that a chemical or steam explosion in a reactor plant could seriously contaminate several square miles.

The final significant health hazard associated with nuclear energy is that resulting from military testing of nuclear devices and weapons. Tests by the United States, the U.S.S.R., and the British Commonwealth all have added measurably to background radiation. Except in the area surrounding the Nevada Test Site, tests have not added detectably to the gamma background as measured on a G-M survey meter. They have, however, added to the airborne radioactivity and to radioactive fallout, rainout, and washout. Health authorities are therefore less concerned with fallout as a source of background radiation than with the possible assimilation and concentration of long-lived radionuclides in all living organisms, with the prospect of injury from their chronic presence in human tissue. The full significance of this fallout is not yet known.

Administration and Standards

Unlike other health hazards, many sources of radiation produced by nuclear energy are beyond the direct jurisdiction of the local or State government. The Federal Government is exercising an unusual influence on both the development and control of nuclear energy. There are, of course, many reasons for this, such as the participation of the AEC in weapons development, national security implications, and

ment of programs to accelerate the use of radionuclides and applied radiation in industry, agriculture, and medicine, and to encourage industrial production and distribution of radionuclides and other radiation sources. In addition, it administers AEC's program for granting access to restricted data pertaining to civilian uses of nuclear energy.

The Division of Inspection is responsible for inspecting license holders to determine compliance with the terms of their licenses. As a general rule inspectors from the division will work with State agencies or keep them advised of their activities.

The basic function of the Public Health Service is to strengthen the capacity of the States to use their powers for the protection and promotion of the public health through radiation protection. The Service also performs activities beyond the powers, competence, or financial ability of the individual States. Thus the functions of the Service may be divided into the following major components:

- Assistance to States: training, consultation, and technical assistance.
- Dealing with interstate problems: pollution of air or interstate streams.
- Collaboration with other Federal agencies or scientific groups on problems which have a health component and need to be dealt with at the national level: exposure tolerances, safe transport, uniform reporting, model legislation, and codes, for example.
- Research, development, and research training: in PHS installations and by extramural grants and stipends.
- Public information.
- Radiological intelligence: nationwide collection, analysis, and dissemination of data useful in conducting radiological health programs.

The Department of Agriculture has a general interest in radiological health to the extent that individuals who produce, handle, process, and market farm products, and the animals and plants upon which this country depends for food, fiber, and other agricultural materials, are affected adversely by radioactive materials. Adverse effects include not only the impairment of health and comfort but the retardation of normal growth and development and accumula-

tion of radionuclides in animals or plant products destined for the food market.

In the Department of Commerce, the National Bureau of Standards is concerned with the measurement of radiation dosages, and physical methods of assessment and control through proper design. The Bureau also sponsors the National Committee on Radiation Protection and Measurement, which is the major authority in the establishment of radiation protection standards in the United States.

The Weather Bureau constitutes an important resource in providing an understanding of the dynamics of natural and manmade radioactivity in the atmosphere. Its forecasting services predict local meteorologic conditions which guide design and operations in minimizing radiation exposure.

The Department of Defense's interests are related to the development, transportation, and detonation of nuclear weapons in peace and war; the effects of nuclear war; and the military applications of nuclear energy for propulsion, food preservation, and packaged power. Operators of military sources of nuclear energy tend to be of ages at which genetic injury has implications more grave than it does for the average industrial or medical users of radiation.

The National Science Foundation has a direct interest in radiation stemming from its statutory responsibilities. Many problems of basic physics, biophysics, genetics, and biology must be solved before a truly scientific approach can be made to the development of health standards suitable for an economy utilizing nuclear energy extensively. Certain grants and fellowships awarded by the National Science Foundation encourage fundamental research in the field of radiological health.

The Food and Drug Administration is interested in the potential contamination of foodstuffs and the assimilation of radioisotopes of elements naturally absorbed by crops grown for food. It is also interested in the effects of radiation used to process foods.

The Children's Bureau of the Social Security Administration has an interest in radiation as it affects the health of children.

The Office of Education's interest lies in the need for training of personnel in nuclear energy and in radiological health.

The American Public Health Association has appointed a committee to work on radiation with the Association of State and Territorial Health Officers and the Conference of State Sanitary Engineers. This committee has prepared a policy statement, model legislation, and an orientation pamphlet, and is developing an administrative guide.

The Council of State Governments has also developed and recommended State legislation dealing with nuclear energy. This suggested legislation encompasses all aspects of the nuclear energy industry rather than health protection alone.

As mentioned before, the Atomic Energy Commission has established health and safety criteria applicable to licensees under the Atomic Energy Act of 1954. These have been published as Standards for Protection Against Radiation (10 CFR 20). While these apply only to establishments under the control of the AEC, they represent the only specific control in States that have adopted no laws or regulations to control radiation hazards. The regulations are based on but are not identical with recommendations of the National Committee on Radiation Protection and Measurement. Some States use these regulations as advisory guides in the absence of specific State regulations, while others use them as models in developing State regulations. The AEC regulations do not cover all sources of radiation, however, and are not entirely applicable to State control.

Role of the Federal Agencies

The Federal Government exercises a greater influence and plays a more direct role in radiation protection than in any other public health program.

The greatest part of the Federal resources is being devoted to military applications. In order to monitor the products of weapons tests, the Public Health Service, under agreement with the Atomic Energy Commission, operates a radiation surveillance network composed of 43 stations equipped to collect air and rain samples and take daily gamma readings. These stations, which also estimate the amount of radioactivity in particulate matter collected

from air samples, are operated by State and local health department personnel. Samples are sent to a PHS laboratory in Washington, D. C., for final counting. Results of the surveillance estimates are immediately made available to the State health officers concerned, and weekly reports of the laboratory are sent to all State health officers.

A Medical Liaison Officer Network, composed of medical personnel from the Public Health Service and State and local health departments, also under agreement with AEC, is available to investigate reports of injury allegedly due to fallout.

With respect to civilian applications of nuclear energy, the AEC plays the Federal Government's major role in radiation protection. The operating arms of AEC dealing with civilian uses of nuclear energy are the Division of Licensing and Regulation, the Office of Industrial Development, and the Division of Inspection.

The Division of Licensing and Regulation handles all regulatory matters, other than inspection activities. Among these are the preparation, issuance, and administration of regulations, issuance of licenses, development of standards, guides, and codes for the safe design, containment, and operation of reactors, and evaluation of the safety aspects of all proposed reactors. Included is responsibility for developing regulations and licensing procedures for the safe handling and use of radionuclides, source material, and special nuclear material.

The division is also responsible for assessing the requirements of the private nuclear energy industry for nuclear materials such as uranium, thorium, and plutonium, and for administering the allocation and distribution of these nuclear materials to licensees.

The Office of Industrial Development, in consultation with other offices and divisions, develops AEC policy and procedures for encouraging the growth and development of peaceful uses of atomic energy. It advises private groups on opportunities open to them. It seeks to identify industrial activities, including those now performed by AEC, which lend themselves to private undertakings, and assists in encouraging industry to enter these fields.

A major function of the office is the develop-

Detailed regulations can best be considered after the needs of the State have been defined. National Bureau of Standards Handbook 61, Regulation of Radiation Exposure by Legislative Means, forms as good a basis as is currently available for the development of such regulations. However, this handbook was not designed to be adopted in toto or verbatim, but to be used as a guide. At the same time, all regulations must be based on the same standards, the recommendations of the National Committee on Radiation Protection and Measurement, which is uniquely qualified to appraise radiation hazards. An impossible situation would develop if individual States and AEC adopted conflicting standards.

The specific organization within a State agency for radiological health will vary, depending on a number of factors. If a significant problem exists in a State, it appears advantageous to designate a person or a specific ad-

ministrative unit as the central point for radiological health. This person or unit may then be the principal point of contact with other interested agencies and can furnish technical assistance to other programs.

In some States, it is perfectly possible that a satisfactory program can be established by adding to each program, such as water pollution control, air pollution control, and milk and food sanitation, the necessary radiation protection responsibilities. This method would be particularly likely if the only radiation protection required were, for example, related to occupational exposure.

A program of radiation protection is complex both technically and administratively. However, with their wealth of experience in public health and with the resources available to assist them, health officials are in a position to move forward in this field as they have in others.

Institute of Veterinary Public Health Practice

The first institute of veterinary public health practice, to be held October 6-9, 1958, at the School of Public Health, University of Michigan, will stress the use of veterinary resources in disciplines of human health.

Speakers include Margaret G. Arnstein, Dr. Gaylord Anderson, Dr. James H. Steele, Dr. H. J. Stafseth, Dr. W. W. Armistead, Dr. T. J. Francis, Jr., Dr. Mark W. Allam, Dr. Albert E. Heustis, Dr. E. H. Cushing, and Dr. R. E. Rebrassier, among a number of others.

Topics scheduled for discussion are the possible contributions of veterinarians and veterinary research to such fields as nursing, geriatrics, mental illness, human cancer, heart disease, industrial hygiene, and radiation hazards.

In separate working sessions under the leadership of five section committees, participants will discuss the most effective ways of using public health veterinarians, private practitioners, regulatory officials, and industrial veterinarians in official and voluntary health programs. The conclusions will be presented in general session.

For more information write to H. E. Miller, Director, Continued Education, School of Public Health, University of Michigan, 109 South Observatory Street, Ann Arbor, Mich.

The Department of Labor is interested in protecting employees exposed occupationally to radiation.

Role of State and Local Governments

Much of the work of the 48 State health departments is advisory and consultative. They establish standards and program policies which are used as guides by local health departments, to whom they have delegated much of the responsibility for applying protective measures. They also provide technical services which are beyond the resources of the local health department.

The States have universally retained final authority with respect to approval of plans for construction and operation of public water supplies, treatment and disposal of sewage and industrial wastes, and control of water pollution. Many are now becoming interested in the control of air pollution. Many also review and approve building plans to assure that the industrial hazards to health are adequately controlled before operations are started.

A pattern may now be developing in the relationship between the Government-sponsored nuclear energy industry and the State agencies. It is urgently desired that the industry be supplied with design and operational health and safety criteria which permit the least restrictions on economy of operation. These, in part, are furnished by the AEC Standards for Protection Against Radiation, which establishes the maximum operational levels acceptable to AEC. State health agencies, with a broad concept of radiological health, are concerned with the total radiation exposure of the population, no matter what the sources of exposure might be. At present, for example, the principal sources of exposure to radiation of a community are, probably, natural background radiation and medical diagnostic X-ray. Health agencies, if they desire to restrict public exposures to a practical minimum, will admit additional sources of radiation only when it is demonstrable that little increase is anticipated and that the possibility of individual hazard is minimized by adequate control procedures.

Obviously, the workload facing the inspection division of the AEC is sizable. The need

for time and experienced personnel will impede its development of a nationwide system designed to relate the levels and effects of radiation to the multitude of public health hazards. The only experts today on integrating the nuclear industry into local situations are the State and local people who deal with public health matters exclusively. The Atomic Energy Commission and the nuclear industry need the assistance of the States and their ability, knowledge, and authority, even as the States need the specialized skills in organizations sponsored by the Federal Government.

The Atomic Energy Commission, by means of its proposed health and safety standards, is showing commendable concern over the eventual effects on the public health that radioactive material may have. No matter how intensive AEC's inspection of its contractors and licensees may be, however, its actions cannot be construed as the practice of public health, although they may make substantial contributions. The responsibility for safeguarding the public health, in any event, still lies with the States and the State and local health agencies.

State Programming

The States, in this position, are looking to their individual problems and equipping themselves to meet them. Their first action in going into the field of radiological health is to seek technical competence in staff. Ideally, they would prefer 1 or more years of graduate training for 1 or more staff members, depending on the needs within the State. Alternatively, and on an interim basis, competence is cultivated in present staff members working on programs, such as water pollution control, associated with nuclear energy. Such staff members may attend short, topical courses of the type offered by the Public Health Service at the Robert A. Taft Sanitary Engineering Center in Cincinnati.

Another early step is to define the needs. Some agencies have utilized existing programs to secure information on radiation sources. Others have enacted legislation specifically authorizing State agencies to conduct a radiation survey. Still others require all users of ionizing radiation to register.

Courses sponsored by the health agencies of five Michigan counties gave nursing home personnel new understanding and a new outlook on their jobs.

Saginaw's Training Courses for Nursing Home Staffs

RALPH E. LEWIS, M.P.H.

FORESIGHTED nursing home operators, realizing that even years of practical experience may not be adequate in coping with the various behavior problems of aged patients, are seeking training for themselves and their employees.

As they see the elderly patients in their homes become more withdrawn, less self-sufficient, and less cooperative, the operators recognize that these people need skilled assistance. And operators are acknowledging that nursing home personnel need training and specialized study to compete successfully in a rapidly expanding field of enterprise.

This was the case in Saginaw County, Mich. In the fall of 1956 the need for some such training was discussed at a meeting of the Saginaw Valley Community Health Services, Inc., a corporation organized in 1952 by the public health agencies of Saginaw, Bay, Midland, Isabella, and Tuscola Counties to provide public health services on a regional basis. Community Health Services then offered a plan for a training course to the Saginaw Association of Approved Nursing Homes. Later several members of the association discussed the need for training with officials of the Saginaw County Health Department.

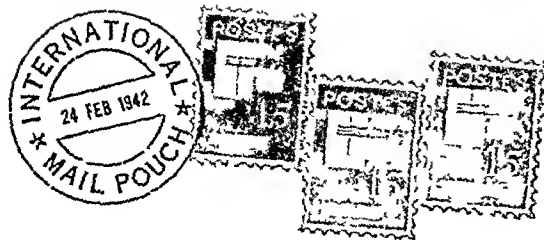
Mr. Lewis, program coordinator for the courses he describes, is health educator of the Saginaw County Health Department, Saginaw, Mich.

Because an area wider than Saginaw County was concerned, the matter was submitted to the board of directors of the Saginaw Valley Community Health Services. After some discussion the board authorized a committee of the health officers of the member counties to explore the possibilities of training nursing home personnel.

The health officers invited representatives from the area's nursing homes, local and State health departments, Saginaw County Hospital, and the University of Michigan's Division of Gerontology and School of Public Health to form an advisory committee to determine the feasibility of developing some type of training for the staffs of nursing homes in their five-county area. Advisory committee members with interests and associations in nursing home administration in Michigan and the Saginaw Valley were appointed.

The committee had many questions. Was a training program really needed? Who would be eligible to attend this training? What subject matter should be covered? Who would the instructors be? How lengthy a course was necessary? Would a single course or successive courses be advisable?

The advisory committee met with the area's nursing home administrators at a regional meeting, visited some of the homes, and talked with employees, patients, and administrators to find answers to these questions.



After the Earthquakes

Continued shocks, horror, grief, hunger, and bitter cold nights virtually paralyzed the people after a series of earthquakes in the provinces of Kermanshah and Hamadan in western Iran in December 1957.

An avalanche of vague, conflicting rumors reached the health department in Kermanshah after the quakes. The more serious seemed to generate from Farsinage, Assadabad, Fash, and Sarab-Sahneh. We dispatched a doctor and a nursing team with first aid supplies, medications, and powdered milk to each location.

I visited Sarab-Sahneh and Fash and later went to the Assadabad area where I found our team in Sirvan, a badly devastated village. We borrowed a tent from the army troops sent there to assist in relief work, and set up a first aid shelter. Nurses prepared hot milk in a salvaged *deeg*, or pot, for the children and mothers. They gulped the milk hungrily; it was the first real nourishment they had had since the disaster some 30 hours before. They had devoted the previous daylight hours to burying more than 40 people killed in the quakes, and the villagers had neither time nor facilities to feed their children or themselves.

From Teheran the U. S. Operations Mission headquarters sent three trucks loaded with 5,000 kilograms of dried milk, perchlorine, and DDT dusting powder. The head of the General Department of Public Health of Iran came from the capital with a crew of engineers, nurses, nurse aides, and sanitary aides. They brought tents, blankets, dried milk, vaccines, biological supplies, DDT, and bandages to the stricken areas.

Luckily the water supply was not damaged; almost all the villages used mountain springs, which, if affected at all, regained their original quality and volume within a few hours after the tremors.

Sanitary aides worked to provide safe excreta disposal. Under the chaotic conditions, conservative

farmers were reluctant to use the unfamiliar latrines. In the press of construction, the privies were not always built in accordance with religious requirements, not always equipped with elevated foot rests, and sometimes lacked even a solid roof.

However, a mere 13 sanitary aides with leadership, a bit of salesmanship, a measure of health education, and a willingness to work with their own hands dotted the landscape with sanitary latrines. Sanitary aide Rostenpour alone was instrumental in building 65 at Farsinage.

—ARLENE WALDHAUS, *public health nurse*, and
GLEN W. McDONALD, M.D., *chief, Public Health Division, U. S. Operations Mission, Iran.*

Chilean Plan

Chile may be the first nation in the world to have at each of its normal schools a faculty member trained in public health.

The Ministry of Education has arranged to have 5 professors from teacher training institutions study at the University of Chile's School of Public Health each year until all 15 of the country's normal schools have a faculty member so trained. A member of the ministry's staff, who is already studying at the school, will develop a department of health education to serve the schools of Chile.

—G. HOWARD GOWEN, M.D., *chief, Health and Sanitation Division, U. S. Operations Mission, Chile.*

Typhoid in Pusan

More than 30,000 people visited an exhibit entitled "Rodents and the Damage They Cause" last winter in Pusan, Korea. The exhibition in the Republic of Korea Information Building and the distribution of a million packages of rodenticide and 50,000 rat traps were part of a rodent eradication campaign.

Pusan had an outbreak of typhoid fever, with 153 cases reported in less than 3 months. To curb transmission of the agent, we cleaned and chlorinated wells and stressed the need to boil drinking water. Efforts to give typhoid vaccinations, particularly to people in the refugee areas, however, met with considerable resistance.

—ALFRED S. LAZARUS, PH.D., *acting chief, Health and Sanitation Division, U. S. Operations Mission, Korea.*

aut hospital superintendent. She considered the qualifications of a good administrator and an efficient employee and the importance of their attitudes toward patients.

3. "Bed Care of the Long-Term Patient," was discussed by a registered nurse who is an instructor of nurses. She demonstrated bed-care methods and displayed materials to make the patient's life more comfortable and enjoyable and the employee's job easier and more efficient.

4. A lecture on the "Medical Needs of the Aged and Chronically Ill," presented by a physician, emphasized the physical, mental, and emotional changes that take place as a person grows older. He described some of the physical and mental needs of the aged and chronically ill, and told how a nursing home staff can assist the physician in taking care of individual patients.

5. A session devoted to "Rehabilitation," designed to introduce the two succeeding sessions on physical therapy and occupational therapy, was also conducted by a physician. He reviewed the newer philosophies of rehabilitation, its aim and function in working with the aged, long-term patient. He also showed the film "Still Going Places," which dramatically illustrates practical ways to help chronically ill or acutely disabled patients of advanced years to live useful, self-sufficient lives.

6. "Physical Therapy," conducted by a registered physical therapist, included a brief historical review and demonstrations of various methods and techniques of physical therapy which can be effectively used with specific types of patients.

7. During the "Occupational Therapy and Hobbycraft" session, motivation and techniques in introducing occupational therapy were discussed, new ideas in the field were explained, and sources of supplies were listed by the two speakers, a registered occupational therapist and a hobbycraft instructor.

8. A nutritionist and a dietitian concentrated their efforts on "Nutrition and Menu Planning." They emphasized the importance of good nutrition for the aged and chronically ill, special diets, meal planning, economical food purchasing, and efficient methods in the kitchen.

9. A sanitary engineer discussed "Sanitation" with emphasis on food handling, dish-washing, construction and design of nursing homes, and safe and sanitary practices for employees and patients. He also reviewed the sanitation regulations governing nursing homes and homes for the aged.

10. A psychiatric social worker dealt with "Mental Health and Psychological Needs and Motivations of the Aged." She described the importance of satisfactory relationships between the patient and the employee, and the employee's need for healthy attitudes and feelings toward the patients in his care.

11. "Recreational and Social Opportunities" for patients was presented by a Salvation Army major. He reviewed what homes in other countries are doing and what is being done in this country, and discussed practical recreational and social activities applicable to patients in nursing homes.

12. The final class session, conducted by two State drug inspectors, dealt with "Dispensing of Drugs and Narcotics" by the nursing home owner to his patients, and his legal responsibilities.

Evaluations

At the opening class 30 people from 15 homes registered. Additional registrations throughout the course brought the final total to 44 students from 21 institutions. Three counties outside the immediate five-county area were represented. Four of the students traveled more than 200 miles for each class session. Among the students were 21 administrators and 23 employees, including 2 private duty nurses. They represented a total of 16 nursing homes and 5 homes for the aged.

The 21 administrators averaged 10.7 grades of school completed, the 23 employees slightly less, with 9.65 grades completed. The administrators averaged 9.25 years of experience in nursing home work and the employees, 5.9 years.

Among the 44 persons enrolled were 1 registered nurse and 2 registered practical nurses; 4 others listed their titles as practical nurse.

No record was kept of who paid the registration fees, but we learned that in two instances

On June 1, 1957, the advisory committee reported to the board of directors of the Saginaw Valley Community Health Services that nursing home personnel wanted and needed educational training, and that a course was feasible, practical, and desirable.

Saginaw Valley Community Health Services, Saginaw County Hospital, and the Division of Gerontology, University of Michigan, agreed to establish and jointly sponsor an experimental training program for nursing home administrators and employees.

After outlining the administrative details, the committee presented the program to the Saginaw Association of Approved Nursing Homes. The association formally approved the course and urged its members to take advantage of it.

Planning the Course

The first course was scheduled to begin June 12, 1957, with 12 weekly sessions held from 7-9 p.m. in the auditorium of Saginaw County Hospital. The trainees' needs and their reactions to these sessions would determine whether the original course would be repeated or a more advanced course offered.

Initially, the advisory committee recommended that the course be open to all persons actively employed in nursing homes, homes for the aged, and county infirmary hospitals in the five counties. The area has 42 of these institutions with a combined capacity of more than 800 beds. Enrollment was encouraged rather than restricted at first; if necessary the class would be divided into smaller groups.

Notices announcing the training course were sent to the 32 nursing homes, 7 homes for the aged, and 3 county infirmary hospitals in the 5-county area. While no enrollments were solicited from institutions outside the 5 counties, staff members from other counties who wanted to take the course were accepted.

A nominal registration fee of \$10 per person was charged to defray the instructors' honorariums and other operating expenses. We also felt that the student who pays for a class is more likely to attend in order to get his money's worth. We planned to issue attendance certificates to those who attended 10 of the 12 sessions.

Instructors were drawn from qualified sources

nearby to keep the program identified locally. Many were in professions dealing with patients similar to those in nursing homes. Some came from the Saginaw County Hospital, the Veterans Administration Hospital, and the local Salvation Army unit, which operates a home for the aged and a golden age club. Others, chosen because of their interest and special knowledge in problems of the aged and chronically ill, were from the State health department, Michigan Board of Pharmacy, Saginaw County Health Department, University of Michigan, and Mt. Pleasant State Home and Training School.

Course Aims and Content

The course was aimed at aiding administrators to operate their homes more efficiently and in the manner most satisfactory to themselves, their employees, and the patients. It was designed to acquaint them with current philosophies of care and rehabilitation of the aged and chronically ill. The course sought to make the staffs of the homes aware that patients have many of the desires, motivations, needs, and likes of all people, and that the aged especially treasure an extra bit of special attention.

The committee felt that staff members who adopted these ideas might significantly improve the quality of their services.

The advisory committee decided on the course's content after meetings with area nursing home personnel. The content was arranged to give the nursing home people a refresher course in their everyday tasks, such as house-keeping, bed-care techniques, and keeping records and reports; to assist the employee in using his equipment and facilities to do better, more efficient work; and to help the administrator use his employees most effectively.

These were the 12 sessions in the first course:

1. The introductory class session was entitled "Opportunities for Nursing Homes and County Infirmary Hospitals in the Treatment of the Aged and Chronically Ill." A professor of gerontology outlined the history of the nursing home in the pattern of medical care of the aged in the United States and evaluated the future of the nursing home.

2. "Patient and Personnel Relations" was presented by a registered nurse who is an assist-

department could review Michigan's new rules and regulations for nursing homes and homes for the aged, adopted in July 1957.

Twenty-five persons, 6 administrators and 19 employees representing 8 homes and 6 counties, registered for the second training course. An administrator and 3 employees came from 2 counties outside the 5-county area. Four homes in the 5 counties were represented for the first time, sending 5 administrators and 13 employees; 4 of the homes represented at the first course sent 1 administrator and 6 employees to the second.

Attendance was good at most class sessions, and all of the 25 people registered qualified for the attendance certificate.

Conscious of the earlier trainees' comments, many instructors attempted, with varying results, different techniques of group dynamics to draw the students into discussions. Arranging the trainees' chairs in a semicircle facing the instructor, and having each student introduce himself at the opening session made the classes less formal and more relaxed.

The instructors also attempted more demonstrations with the trainees participating. At the session on physical therapy the trainees, after watching a demonstration on massage and limb manipulation, practiced on a "patient." The instructors in occupational therapy and hobbycraft showed how to make a Christmas corsage and how to weave a potholder; then the students were given materials and encouraged to use their imaginations in making corsages and potholders.

In their evaluation questionnaires the majority of those in the second course commented favorably on the effectiveness of the group discussion and student participation in certain sessions, justifying the inclusion of these practices in the training course.

The advisory committee has met with the Saginaw Association of Approved Nursing Homes a number of times since the second course ended. The nursing home group commended Saginaw Valley Community Health Services for its service to the nursing homes in the area and inquired about future courses. The interest that has continued after the first two courses has justified plans for a third course, containing new subject matter. We

hope it will be part of a continuous series of training sessions for nursing home administrators and employees in the Saginaw Valley.

Planned for these future courses are detailed subject matter on nursing techniques, including bed and tub baths; comfort and safety devices, such as methods of lifting and moving patients in bed and from beds to chairs; the mechanics of taking temperatures, pulse, and respiration; and general care of the patient's skin, mouth, hair, teeth, and feet.

Conclusions

These two training courses have demonstrated that many nursing home administrators and their employees recognize their own need for help and guidance in their profession, and that they are willing to attend and support organized training which seeks to fulfill their needs.

Independent observations by health department officials who inspect and supervise nursing homes in this area, as well as opinions from certain nursing home administrators, indicate that those who have taken one of the training courses appear to have somewhat modified their attitudes and thinking toward their jobs and the patients in their care. This conclusion is evident in the better quality of work they are doing.

During the class sessions, the students' faces reflected new understanding and new enthusiasm for their jobs. Time and time again they asked the instructors for solutions or suggestions on their specific problems, indicating a desire to act positively.

The actual results of these courses cannot be measured. But the sponsors feel that they were a constructive first step toward improving the nursing homes in the area. If the trainees have learned that patients are people who react and respond as do all other human beings, that nursing home staffs have the power to make life pleasant and worthwhile for their patients, then the students, having gained a new outlook, will do their jobs better.

Those who have worked so diligently to make these courses a reality know that such training is not a panacea. However, they believe that education is the best way to improve habits, attitudes, and conditions in the nursing homes.

fees were paid by the board of directors of nursing homes, and 2 employers paid the fees for their employees, 5 employees in one instance, 3 in the other.

Early in the course, when it became evident that the trainees were not accustomed to taking notes and were losing much helpful information, mimeographed, detailed summaries of each instructor's presentation were made available on a trial basis. These proved to be very popular with the students, and the summaries were continued.

At the 11th session, a single-page questionnaire of 11 subjective questions, to be answered anonymously and returned a week later, was given the trainees. This questionnaire was an effort to ascertain what they had expected to get out of the course, what additional topics they believed should have been included, and what topics they would have eliminated. The participants were also asked about such matters as the coffee break and the time and length of the class sessions.

The trainees had had numerous opportunities to express their desires and preferences during class, but they were questioned at the end of the course so that their opinions would cover all the sessions and be useful to the advisory committee in planning future courses.

Seventy-one percent of the questionnaires were returned and provided valuable information concerning the students' reactions.

For example, the instructor who "had no idea of our problems" or who "didn't apply his subject to our situation" was immediately unmasked by the students. The trainees felt that two of the instructors were not well enough acquainted with the specific problems of caring for the aged and chronically ill patient. However, the majority of the students felt that most of the instructors' subject matter was "very practical and worthwhile" and that the suggestions "worked with our patients."

While the students generally approved the choice of subject matter, they felt they needed more detailed instruction in meal planning, techniques of bed care, motivation of the patient in areas of rehabilitation, and means for satisfying the patients' emotional and mental needs. Numerous trainees suggested eliminating physical therapy, because "our patients are

too old" and "we don't have the time to spend doing it." Generally, they also felt that the session on "Drugs and Narcotics" was only of interest to administrators and therefore should be dropped.

Although the instructors tried to draw the students into group discussions, they did not always succeed, possibly because of the instructor's lack of skill, or simply because of the trainees' reluctance to speak out. Yet 55 percent of those who responded to the questionnaire thought that more group discussion was needed and would make the training sessions more meaningful. This suggestion was emphasized by the fact that many students gathered around the instructor to ask questions and express opinions during the coffee break and after class, although they had failed to respond to the instructor's repeated attempts to draw them into group discussion during the session.

Attendance remained unexpectedly high throughout the course, with not more than five persons absent from any one session, despite some very bad driving weather. Of the 44 registrants, 38 qualified for attendance certificates; 5 of the 6 who failed to qualify attended classes in the second course and received attendance certificates.

Second Course

Because of the success of the first course, and the continuing need for this training, a second course, to begin early in October 1957, was initiated.

Representatives of the advisory committee discussed the second course with members of the regional nursing home association. They planned the second course after considering the results of this discussion and evaluating the questionnaires from the first course.

The second course was essentially the same as the first. Less than half of the nursing homes in the five counties were represented at the first course, and we hoped that additional homes as well as other employees from those previously represented would participate.

One major change was replacing "Drugs and Narcotics" with a session on "Rules and Regulations." "Rules and Regulations" was added so that a representative from the State health

Need Cited for Attention To Basic Sciences

Unless orthopsychiatry takes cognizance of the work being done in the basic sciences, it may well be a horse-and-buggy discipline in a world of motor cars, warned Dr. Reginald S. Lourie, president of the American Orthopsychiatric Association, and director, department of psychiatry, Children's Hospital, Washington, D. C.

Lourie stressed the basic work of neurophysiology and neurochemistry as having "profound implications for our patterns of professional work in the future."

Some of the factors that threaten to mire down the horse and buggy, he said, are the advent of new drugs, the future of psychoanalysis in light of the advances in biochemistry, and management of brain-damaged children. The development of tranquilizers, the salvaging of babies, many of whom have brain injuries, and discoveries in cytological life functioning are part of the new, "motorized" age, he said.

The main thing, Lourie urged, is to see that these sciences cooperate in interdisciplinary roles. He suggested five ways in which the orthopsychiatric profession can prepare itself to advance its interdisciplinary status:

- Communication patterns need to be clarified. Nomenclature common to different disciplines has different meanings ("energy" and "activity," for example). Semantic differences can be overcome if modifications can be accepted as natural, useful, and foreseen eventualities. "Trend himself," Lourie commented, "felt that his ways of describing the phenomena he found were modifiable. He changed his concept, for example, of psychologically based drives to one of forces, somatically based, underlying the drives." The days of usefulness of Freud's terminology will be numbered when we can pinpoint the origin of the forces and control them, he said.

- To prevent compartmentalization of knowledge, all members of the orthopsychiatric team should be acquainted with the structure, phys-

iology, and chemistry of the brain. The extent of training would vary with an individual's specialty and need to know.

- Basic scientists should work as part of the orthopsychiatric team, at least for brief periods of time. All would learn from each other and true interdisciplinary research would be effected.

- Contributions by specialists in orthopsychiatric fields should continue at a high level, avoiding a low common denominator and guarding the interdisciplinary functioning.

- New explorations and speculations must be encouraged. Observational abilities should be cultivated to evaluate new directions, choosing those with promise and putting aside those that appear fruitless.

Finds Therapeutic Milieu A Complex of Variables

Dr. Fritz Redl, National Institute of Mental Health, Public Health Service, reviewed the concept of the patient's milieu as a factor in psychotherapy.

Confusion in the early concepts has led many people into the trap of seeking "the" therapeutic milieu, he said. It is not possible to determine whether a milieu is in itself good or bad or truly therapeutic on the basis of our philosophical, ethical, or political convictions, or our "taste buds." Those who adhere to the concept of total milieu therapy also need to remain cognizant of the fact that elements of the milieu are not equally important or constantly relevant in all situations. In some situations, for instance, the "peeking order," which determines the position of power, is operable; in other situations, it is not. "The thing that counts," Redl asserted, "is not only the description of a variable, but the assessment of the potential impact on the treatment process of a given group of patients."

It is naive, he went on to say, to think that the discovery of a needed milieu "would automatically make it easy to produce that style of milieu in a given place."

The adjective "therapeutic" he mentioned as another trap, and listed seven common meanings of therapeutic to be found in scientific writings. Therapeutic might mean, for example, "don't put poison in their soup," a translation of "the demand for absence of crude forms of punishment in a place that calls itself a residential treatment center." It might also mean, "you still have to feed them," the implication of the belief that children must have an activity program even though the plan of therapy is not concerned with play or diet.

"Milieu" is also a difficult word to define, Redl pointed out. He briefly outlined some of the factors that would be clinically relevant to therapeutic goals, choices in techniques, and assets or liabilities in various phases of therapy. Among these factors would be:

1. Social structure, comprising the type of hospital ward; the distribution of adult roles, in order that patients may be clear about who may make what decisions; the pecking order among the patients; and the communication network that enables the patient to know who can be approached to listen to certain problems.

2. "The value system that oozes out of our pores," for patients can "smell" what a staff feels, regardless of what it says.

3. The routines, rituals, and other behavioral regulations that have an impact upon the ability of the individual to maintain self-control.

4. Group relationships with respect to scapegoats, mascots, cliques, role playing, mob psychology, leadership tensions, and other such forces that demand more concern than "the curious stares of an anthropological slumming party."

5. Personality peculiarities that a patient "swings around his body like a wet towel hitting whoever gets in its path, innocent or not." Personality traits are "real things that hit and scratch if you get in their way."

6. The staff's attitudes and feelings that actually have an impact on the clinic situation.

7. The behavioral output by others to which a patient is exposed, and

The Orthopsychiatric Approach to mental health

CONFERENCE REPORT

At the 35th annual meeting of the American Orthopsychiatric Association, held in New York City on March 6-8, 1958, 70-some papers were presented on various problems of human behavior.

The Association, formed in 1924, is primarily concerned with the development of an integrated approach to the understanding and treatment of human beings as physical, mental, and social entities. It seeks to promote "straight-mindedness" (which the term "orthopsychiatry" connotes), essentially in preventive, therapeutic activities. The annual meeting serves as a forum and a unifying force for psychiatrists, clinical psychologists, psychiatric social workers, and allied specialists concerned with emotional and mental illness.

Eleven papers from the meeting, summarized on the following pages, present several facets of the orthopsychiatric activities.

persons reached by questionnaires or by telephone and personal interviews.

Answers revealed that 40 percent had obtained treatment and 54 percent had not. Of those treated, 75 percent obtained treatment from one of the community's resources suggested by Reiss-Davis. The other 25 percent obtained treatment on their own initiative from other resources. Of those who had not obtained treatment, approximately 25 percent each made no further attempt to find help, contacted suggested sources but abandoned all efforts when refused further, did not try these sources but tried others before giving up, and last, tried many sources, those suggested as well as others, but failed to obtain treatment.

"The reason most frequently given for the inability to obtain treatment by those who made further effort," Fowler and Novick commented, "was that the other community resources also could not provide service within a relatively short time."

One important finding, the authors stated, was that almost 45 percent of those who had not obtained treatment felt that the problem was either solved or conditions had improved to the point where professional help was unnecessary. The authors speculated on the reason for this, but observed that their study could not prove, for example, that the mere interest in treatment the parents had shown resulted in some improvement, or that the conditions had changed.

"If further studies could establish that improvement without treatment could be predicted in certain delineated situations or at specific maturational phases, what a boon this would be for all who work with troubled people," they said. Criteria would then exist to permit the selection of those "who must be treated and those who could be kept off waiting lists."

Recognition of parental frustration in these matters led Fowler and Novick to a thoughtful consideration of a clinic's relationship to those who, for the first time, seek help. The authors recommend the following:

"Procedures in clinics for telephone interviewing should be developed so that everyone engaged in this important public relations function will act with sensitivity and thoughtfulness when talking to a troubled parent who may be faced with a discouraging number of rejections from other community facilities.

"It is important to realize that a parent's application to a clinic may be his first step toward achieving a better adjustment, whether treatment does or does not ensue. If an agency mishandles this first contact, the parent may become immobilized or even regressed, thereby impairing his ability to deal with his problem. If, on the other hand, every member of the clinic staff is aware of the therapeutic value of every contact, then these contacts can be made constructive experiences for the parent, mobilizing his strength to obtain treatment or to handle his situation better.

"Some parents cannot afford to take time off from work to accept treatment offered during regular hours. Clinics should consider the feasibility of adding Saturday or evening hours for marginal income families whose financial stability would be jeopardized if the parent must have weekly sessions during the working day."

Treatment Not Significant In Child Adjustment

An evaluative followup study, conducted by Dr. Eugene E. Levitt, Indiana University Medical Center, and Dr. Helen R. Beiser and Dr. Raymond E. Robertson, Illinois Institute for Juvenile Research, revealed no significant differences in adjustment between psychotherapeutically treated and untreated child patients.

The purpose of the study was to evaluate the effect of psychotherapy at the Institute for Juvenile Research, an agency of the Illinois State Department of Welfare.

For their study, adjustment was defined on the basis of 26 variables; followup meant 5 to 6 years on the

average after the case was closed; and a treated case was one in which at least one member of a family had a minimum of ten 1-hour therapeutic interviews.

Four methods of obtaining a control group were examined and rejected by the authors:

1. Use of patients discharged from State hospitals, because persons in hospitals are usually more disturbed than those in clinic or outpatient groups, and the criteria for discharge are not well defined.

2. Correlational analyses based on certain hypotheses, such as improvement as a function of the number of treatment interviews instead of an actual control group, because results may be equivocal.

3. Use of cases diagnostically eliminated from treatment, because the groups would differ importantly with regard to prognosis.

4. Use of alternate cases in the same group for treatment and control, because the clinic cannot ask the control group to wait too long for treatment. Some will seek therapy elsewhere, and evaluation could only be made at close of treatment and not at followup.

A fifth procedure, and the one accepted for this study, is to use "defectors" for the control group. Defectors are persons accepted for treatment but who fail to undergo treatment.

A sample of 1,006 cases was randomly selected from among treated (experimental) and untreated (control) cases. A total of 327 experimental and 142 control cases actually participated in the first stages of the study. The experimental group number was further reduced to 192 cases, when the qualification of at least ten 1-hour treatment interviews was introduced as a factor in selection.

A study of the experimental and control groups revealed no significant differences in adjustment between the two groups, the authors stated, but mentioned a few conditions upon which this estimate was based.

First of all, the conditions under which the study was made refer specifically to those prevalent at the Illinois Institute for Juvenile Re-

which is distinct from the underlying feelings out of which people act.

8. Activities patients are requested to perform and the performance required of them ("constituent performances").

9. Space, equipment, time, and props: the space the patients work in, the time permitted for various activities, the medical and other equipment, and other "properties" of a clinical setup.

10. "The seepage from the world outside": the impact of visitors, the "sociological body odor" of the old neighborhood the patient may see in being transported from one place to another, excursions, movies, television shows, all the things that impinge upon and break open the institutional setting.

11. The "traffic" regulations of social interactions that normal life leaves to a person's own resources, and the "umpiring" services that may or may not be provided to protect a patient from specific experiences or to interpret certain experiences for him.

12. The "thermostat" for regulating the behavior of patients according to their needs during different phases of treatment. (Behavioral ceilings must be lowered when impulse-panic looms and raised when self-imposed internal pressures mount.)

In the face of so many complex variables, Redl proposed that the clinician isolate ingredients in the milieu as they affect patients in a specific setting during a specific activity. If the clinician knows the actual experience that a concrete situation has produced in a patient as well as what the patient did with the experience, then "milieu" will make more sense, Redl said.

Drift Theory Inadequate, Investigation Reveals

Investigation of the hypothesis that schizophrenics tend to drift into socioeconomically lower sections of a city was reported by Dr. Robert Plank of the Veterans Administration in Cleveland, Ohio.

Four major hypotheses have been offered in the past to explain why schizophrenics are consistently admitted into hospitals in larger numbers from socioeconomically low central districts:

- Statistical artifacts may have clouded the true proportion.

- In certain neighborhoods, schizophrenics are more likely to get into difficulties and therefore to be noticed. This is called the visibility hypothesis.

- The drift hypothesis.

- The breeder hypothesis, which assumes that the type of neighborhood is causally related to schizophrenia, so that by living in certain neighborhoods some people are more apt to develop schizophrenia.

Plank observed that the last two hypotheses are now receiving the most attention.

For his study, Plank selected active cases of schizophrenia at a Veterans Administration mental hygiene clinic. They were white, male, and veterans of World War II. The reasons he gave for selecting this group were: (a) whites have more freedom of residential mobility than nonwhites; (b) men have different residential patterns from women and also there were fewer women; and (c) veterans of World War II provide men of similar ages for experimental and control groups.

The number of veterans in both groups was 32, for a total of 64 in the study. Their present place of residence was compared with their residence at the time of induction into military service. Plank concluded that there was no evidence that these schizophrenics had tended to drift into lower neighborhoods. "but it is shown that they tend to stand still on the residential level on which they are while other people move upward."

The effect of marriage status was next examined, and Plank found that those who were single at induction but were now married had tended to move upward. For the others, there was a balanced upward and downward movement.

When living arrangements were compared, results were similar to those on marital status. Men living

with parents or someone in place of parents at the time of induction, but were no longer, showed an upward tendency. The others were about balanced.

"In considering these figures in conjunction with individual case histories," Plank stated, "we find several patterns clearly emerging. The prevailing pattern is marked by two concerted steps in young adulthood: marriage and emancipation from parental figures. This involves a change in living arrangements which in our culture often opens the way to a residential upward movement. The typical schizophrenic patterns are characterized by the absence of these elements. . . . The new element that recent ecologic research has introduced is that we now have evidence that these patterns account for the relative drift."

We have to consider, Plank concluded, that while studies such as these help us understand the rationale of the drift hypothesis, a similar job is also being done for the breeder hypothesis. Understanding and, eventually, better control of schizophrenia through ecology would be forthcoming "if we were in a better position to see the dynamics by which a type of neighborhood can foster the development of schizophrenia in individuals who live there," he said.

Recovery Ratio Is High For Untreated Applicants

What do families do when they apply to a child guidance clinic for help but cannot be accepted? This question was posed by Sylvia Fowler, chief psychiatric social worker, Reiss-Davis Clinic for Child Guidance, Los Angeles, Calif., and Mary B. Novick, lecturer, School of Social Welfare, University of California, Los Angeles.

At the Reiss-Davis Clinic, where this study was conducted, less than a third of the applicants for treatment could be accommodated. In a 6-month period, 383 applicants were referred elsewhere. Of these, 145 were selected for followup, with 107

more personal desires: they wished to travel, live in a new home, and so on.

The religious persons had more personal fear of death than the non-religious. They expressed concern with purgatory or hell and with their failure to expiate sins, in contrast with the nonreligious who more frequently wished to continue their work in life, provide for their families, finish undertakings, or enjoy their experiences. Even those religious ones who expected to go to heaven were not all free from the fear of death.

Feifel suggested that the fear of death could well be one of the reasons connected with society's rejection of the aged. He also felt that it would be interesting to examine the attitudes toward death of those working in the "life saving" professions.

To deny or ignore death, Feifel said, is to distort life's pattern. Human maturity, he said, entails a recognition of limit. "We are not altogether free in any deed as long as we are commanded by an inescapable will to live. . . . Not until man overcame the fear of death could he permit himself to be bitten voluntarily by a [yellow fever] mosquito, sail to the seven seas, or master the art of flying."

Feifel found that dying patients wished to talk about their feelings and thoughts about death but felt that they were denied the opportunity by those who look after them.

He said a large number of terminal patients prefer honest and plain talk about the seriousness of their illness. "They have a sense of being understood and helped . . . when they can talk about their feelings concerning death. There is truth in the idea that the unknown can be feared more than the most dreaded reality. . . . Patients can accept and integrate information that they are to die in the near future but want a gradual leading-up to this rather than a 'cold shower' technique, as one patient put it."

Feifel said the reaction of the patient to such information depends on his character more than on the event itself. He adds, "The crisis is often not the fact of oncoming death

per se . . . but rather the waste of limited years, the unassayed tasks, the locked opportunities, the talents withering in disuse, the avoidable evils which have been done. The tragedy which is underlined is that man dies prematurely and without dignity, that death has not become really 'his own.'"

Consistent Help Needed For Problem Families

Chronic problem families functioning at primitive and regressed levels can be helped if social agency workers maintain consistent relationships with the family over a long period of time rather than at sporadic intervals. Moreover, services provided for the family must be flexible to meet its needs and must be immediately available. Initial emphasis must be on material support.

These were the conclusions presented by Dr. Joan J. Zilbach of the Judge Baker Guidance Center and United Community Services in Boston, Mass., Lester G. Houston, Greater Boston Council for Youth, and Emily C. Faucett, Smith College School for Social Work, reporting on their study of selected families in Roxbury, Boston.

Seven public and private social agencies pooled their resources "to develop more effective methods for reaching and serving chronic problem families," the authors stated.

Criteria for inclusion in the study were: (a) repeated contacts with social or law enforcement agencies over a minimum of 3 years, with requests for assistance; (b) at least one child in the family under 13 years old; and (c) at least one child in the family who had experienced social difficulties.

Eighteen families were selected for study. These families live in urban areas with high rates of social disorganization and delinquency. All had had at least 15 years contact with 10 or more agencies. With so many agencies trying to help them, duplication and ineffectiveness of services and lack of coordination between the agencies were discovered by the researchers.

Children in these families presented numerous problems, running the gamut from physical handicaps to sexual delinquency. Many had been in courts and State institutions of correction. Surprisingly, the authors commented, "only one family had been known to a child guidance clinic."

In many of the families, fathers were elusive or nonexistent. Fathers and mothers came from homes marked by physical handicaps, psychosis, alcoholism, illegitimacy, prostitution, or imprisonment of one or both of the parents.

According to the type of relationship the mothers had with their families and other persons in the community, the families fell into two broad classifications. Mothers in the first group showed strong attachments to their children, often having many. And they resented any efforts of the social worker except the offering of material assistance. Mothers in this group, however, were able to request medical care for their children even when they were unable to do this for themselves.

Mothers in the second group were characterized by apathy and impersonal relations with those around them. Whereas mothers in the first group exacted from their children fulfillment for the deprivations they had suffered themselves in childhood, maintaining ties with their children when they moved away, those in the second group neglected and ignored their children.

These emotionally deprived people, it was observed, "have learned to function in a fragmented way without the ability to move forward from a primitive level." Their needs are difficult to understand, and agencies that merely supply their requests for concrete assistance do not help them towards individuation, independence, and self-support, the authors pointed out.

Social workers must involve themselves in the routine and repetitious crises of chronic problem families, however difficult such a relationship may be—and chronic problem families are "notable for their ability to rout and defeat the hardest worker." By meeting emotional as well as

search. Second, almost half of the individuals treated were in the hands of relatively inexperienced personnel (students or those with less than 1 year of experience). Third, 34 percent of the patients were treated by more than one therapist, and 90 percent had been seen only once a week.

The authors concluded that the results of the study are due in some part to less than optimal conditions of therapy. "However," they added, "the data themselves do not bear directly on this hypothesis."

Behavior a Function Of Person and Setting

Contributions to mental health and psychological therapy would be more significant if the psychological aspects of environmental factors were classified and quantified along with the "internal" variables of personality, suggested Dr. Harold Raush, Child Research Branch, National Institute of Mental Health, Public Health Service.

Although the investigator is faced with difficulty in defining situations, it can be shown that the particular setting affects the kind of behavior that one sees, Raush said. He indicated that such considerations have implications for problems of diagnosis and psychotherapy. One simple illustration, Raush observed, was that two members of a staff might disagree about the improvement of a patient depending upon where they observed his behavior.

"People exist, behave, fantasy, and think in specific environments, and conversely, for psychology at least, situations exist only in the sense that they impinge on specific organisms," he said. We can predict something about behavior when we know the person involved, and we can predict something about behavior when we know the kind of situation, but, he added, there remains the issue of interconnections between persons and situations. Persons and situations do not work additively in their contribution to behavior, Raush noted. Thus, the ability to gauge the direction of behavior is enhanced far be-

yond an additive function when one's focus is on the interaction between person and situation.

Raush raised the point that two patients could react to the same psychological features of a situation in different ways or "scan the same situation for different features." This obviously implies that variables of personality cannot be played down while one is considering the variables of a situation. "It is at the juncture of these two classes of variables that we meet behavior," he concluded, "and it is the study of this juncture that I should like to emphasize."

Public Health Nurses Promote Mental Health

Public health nurses are a potent resource in the promotion of mental health, commented Dr. Hildegard E. Peplau, associate professor of nursing and director of the program in advanced psychiatric nursing at the Newark College of Nursing of Rutgers University.

Informing the lay public and obtaining its moral and financial support are activities in which the public health nurse has proved herself particularly able, Peplau said. The capabilities of the public health nurse along these lines, she added, are in direct proportion to the confidence and respect she has won through her constant endeavors in the public's interest.

Of particular importance to the promotion of mental health, she said, is the public health nurse's skill and understanding. In times of family crises as well as at those times when a sustained, sympathetic relationship is called for, the public health nurse is prepared to provide support, information, and counsel for the anxious people she may serve.

The public health nurse is also in a strategic position to offset the consequences or to prevent the occurrence of mental illness.

Peplau pointed out that case finding, prompt referral for early treatment, and therapy are routine activities for the nurse and can be easily extended into the field of men-

tal health. In addition, the nurse can bring to the attention of those in need new treatment facilities. She can inform families about the nature and extent of illness in a member of the family, and prepare them for responsible attitudes toward such members when they are returned from hospital care. Lastly, mental health education can be inculcated without difficulty into the public health nurse's normal activities, Peplau said.

Dying Patients Prefer Talking About Death

Two dominant attitudes toward death were discussed by Dr. Herman Feifel of the Veterans Administration Mental Hygiene Clinic, Los Angeles, Calif. One views death in a philosophic vein as the natural end process of life. The other, the religious perception, is that death is really the beginning of a new life and a termination only of physical existence. From these attitudes two contrasting ethics may be derived: a stoic acceptance, or an idealistic glorification of death (or the "after-life") that gives meaning to the biological cycle.

Feifel offered an interim report of the results of questions about death he asked 85 mental patients with a mean age of 36; 40 aged persons with a mean age of 67; 50 young people, mean age 26; and 35 professionals, mean age 40.

Patients were asked what disease they expected to die from. The majority were unable to associate their prospect of death with a specific disease, but a high proportion of mental patients visualized themselves as dying in a violent accident. Most patients hoped to die quickly and with little suffering.

In response to the question, "If you could do only one more thing before dying, what would you choose?" the mental patients voiced religious or social interests. "Give my belongings to charity . . . stop war if possible . . . know more of God," they said. The young persons and professionals, in contrast, expressed



Data Gathering

by Long Distance Telephone

HILARY G. FRY, Ph.D., and SYLVIA McNAIR

A RESEARCH technique relieving many of the headaches in ordinary data gathering was developed during a recent study by the Hospital Research and Educational Trust. Questionnaires were mailed to a widely scattered group of people who were then interviewed by long-distance telephone. The method proved efficient and effective, and at the same time relatively inexpensive.

The research undertaken was an administrative study of hospital planning and license laws, and the field to be covered was both broad and deep. We were concerned with the administration of the following separate but related State programs in 52 States and Territories: hospital survey and construction (Hill-Burton), hospital licensing, and nursing home licensing. While

Dr. Fry was project director, and Mrs. McNair, research assistant, with the Hospital Research and Educational Trust in Chicago. The article is based on the experience of the authors on project W-42, Operation of Hospital Planning and License Laws, which was supported by a research grant from the Division of Hospital and Medical Facilities, Public Health Service.

in some States the three programs were integrated under a single administration, the problems were nonetheless distinct from one program to another. Variation from State to State existed in every phase of the operations—in the legal structure, in the organization, and even in the philosophy underlying the programs. Our objective was to analyze the programs all the way from the enabling legislation to the question of “where do we go from here”; to describe existing conditions and to make recommendations for the future.

As a first step toward acquainting ourselves with the existing programs, our staff members visited seven States in the summer and fall of 1956. We talked with two groups—State officials concerned with the administration of the programs and nongovernmental persons representative of those affected by the programs. Interviews were based on 6 questionnaires containing up to 125 questions. These questions covered the following:

- The law.
- The regulations written under the law, making it more specific.
- The philosophy of the agency: whether its

material needs, "work with families has become not only more understandable but more fruitful," they observed.

Antisocial Behavior in Boys Traced to Their Mothers

In a study of 20 aggressive, antagonistic, and antisocial boys without fathers, the relationship between mother and son was revealed to be intense, highly sexualized, and full of hostility and guilt.

Reporting on this study were Dr. Howard L. Wylie, assistant director, and Dr. Rafael A. Delgado, psychiatrist, of the Worcester Youth Guidance Center in Massachusetts.

The mothers came to the center under external pressure, usually from school authorities, with the chief complaint that their sons could not be controlled or disciplined. The mothers, it turned out, treated their sons in much the same way they had treated their husbands, and, in most cases, that relationship had been a stormy one, Wylie and Delgado said.

The particular forms of behavior the mothers imposed upon their sons were seductive and punitive, the authors said. In many instances, mothers shared their beds with their sons, bathed them at an age when the boys were quite capable of bathing themselves, wrestled with them, and engaged in other sexually charged, symbolic activities.

Punitive measures, apparently arising from hatred for the former mate, self-derogation, or guilt over the sexual substitution of son for father, were inflicted by many mothers on their sons. "We often have the feeling," the authors said, "that the mothers were driven by an intense need to see their sons behind bars." For some mothers, this seemed to be a protective measure: they feared hereditary incompetence and a consequent emulation of the

scorned father by the son. For other mothers, an imprisoned son would be means to a symbolic revenge upon the father.

The boys, reacting to this love-hatred complex, took their revenge through a variety of antisocial activities. Aggressiveness and belligerence were accompanied by enuresis and soiling, and, occasionally, delinquent acts. Several had appeared in courts and three were in corrective institutions, the authors found.

The mothers could not all be delineated in precisely the same terms. Some had found replacements for their husbands and, on the one hand, were adjusting to their situation better, and, on the other, were replacing their sons with psychologically more valid objects for their love. Other mothers were persistent in their substitution of son for father, and still others were "dominated by a vengeful, competitive attitude toward males, and by a strong wish to be a man. These women looked upon their sons as the fulfillment of this wish," the authors averred.

Therapeutically, the situation was not enviable, and the authors said that their attempts to help these people had not been very successful. Most of the mothers rejected the offer of treatment outright or withdrew after a few visits. Most of those who came showed a blatant resistance to treatment. The boys were also seen for only brief periods of time. Those that showed some improvement rapidly relapsed into their former behavior when they returned to their unchanged environment.

Recognizing that the significance of their findings is open to some question, the authors described several limitations that restrict their conclusions and require further investigation: (a) some boys with fathers behave similarly to these boys; (b) not all boys without fathers behave this way; (c) siblings of these antisocial boys may or

may not conform to the same behavioral patterns in the same circumstances; and (d) the socially antagonistic behavior of the child, so far as it is an extension of the mother's maladjustment, may be transitory if the mother is capable of forming a valid relationship with another man and is in the process of doing so.

Atomic Radiation Poses Mental Health Hazards

Atomic radiation "is surrounded with an aura of mystery and must be expected to evoke strong emotional reactions," according to Dr. Frank Fremont-Smith, member of the executive board of the World Federation for Mental Health.

Citing an atomic radiation incident in Windscale, England, another in Holland, and a third in Houston, Tex., Fremont-Smith pointed out that each gave rise to anxieties and fears disproportionate to what the factual situation called for. The problem, he said, was primarily a failure in proper communication, both in official and public domains, so that there was a loss of confidence in the responsible authorities.

He referred to present anxieties about X-rays as an analogous situation. With a great deal of publicity directed toward the dangers of X-rays and faulty equipment, a number of people have refused to permit roentgenograms to be taken, even when urgently required for proper diagnosis.

"The mental health problems of the peaceful use of atomic energy are the mental health problems of preventing war," he concluded, "and with the advent of nuclear weapons the problem of preventing war has become the human problem of human survival. The real issue is not the peaceful use of atomic power but the peaceful use of human power."

also possible to talk and listen without picking up the receiver. Thus, the interviewer's hands were free for taking notes and handling papers. This device was especially advantageous to us. Many respondents were familiar with more than one of the State programs and made comments pertinent to the work of more than one of our specialists. With the hands-free set, more than one specialist could listen in on the interview.

- Supplying the telephone company with a weekly list of names and addresses of the individuals scheduled for calls, an arrangement called "sequence calling."

The next task was to prepare six separate questionnaires: one each for the Hill-Burton, hospital licensing, and nursing home licensing programs to be answered by government agency people, and another set for nongovernmental people. In an effort to devise questionnaires which would be practical in long-distance calls, we edited, shortened, and combined questions from the detailed surveys made during our visits to the seven States. The final drafts contained from 15 to 24 items each. Every effort was made to write as lucidly and specifically as if the questions were to be answered by mail.

These questions were designed to obtain information on the law, regulations, and philosophy of the program, and on the organization, staffing, and operational procedures of the agency. The basic purpose of the survey was to help us identify the persistent problems in the operation of these programs, for it was on these problems that we planned to concentrate our attention. Hence there were virtually no strictly informational questions included in these questionnaires—no "nose count" on "how many States follow what practice."

The questions, particularly those for the nongovernmental people, were principally opinion-type. These we regarded as basic questions: Did they think the Hill-Burton planning in their State had been well tailored to the needs of the State? What services did they think the State Hill-Burton agency should perform for Hill-Burton hospitals? For other hospitals? How thorough were the inspections of hospitals and nursing homes in the State? Were they thorough enough to insure compliance with minimum standards?

In addition, we included a group of multiple-choice questions on both the present and the ideal program. Such questions covered the role of the advisory council, status of the educational program in the State, techniques for putting the State's Hill-Burton plan into effect, how much "toughness" should be used by the State agency in enforcing minimum operational standards, and others. These questions would tell us not only how much agreement there was on present practices, but whether the governmental and nongovernmental people could conscientiously work toward the same goals.

Before selecting nongovernmental persons to be interviewed, we consulted many State hospital and nursing home associations as to which people in their respective States were most familiar with the programs. The list included representatives of medical, hospital, religious, nursing, and nursing home associations, and, in a few instances, of allied fields such as dentistry and architecture. A high percentage were serving or had at one time served on an advisory council to a State program.

Mimeographed copies of the questionnaires were mailed to these individuals with covering letters explaining our plans and informing the recipients that we expected to telephone during a specified week. The mailing was staggered so that the letters arrived about a week before the call was made. This gave the individuals time to think about the questions and make some preparation for answering, but not time enough to file them away and forget them.

In making up the weekly list for the telephone company, calls were scheduled according to normal working hours in the various time zones. The number of calls planned per day was kept low enough to allow for adequate discussion time and for "writing-up" time following the call.

As each call went through, the operator asked the following type of question. "Are you ready to talk with Mr. Fry of the American Hospital Association about the questionnaire?" If the respondent said "No," she would then try to set up a specified time for the interview. There was no charge for this service.

The respondent followed his own copy of the questionnaire while the interviewer noted the

approach is educational or purely regulatory, or combination of the two.

- The organization and staffing of the agency.
- The operational procedures used in the program.

The information from these visits was invaluable. But their greatest value, perhaps, lay in what they proved we could not do. We found that it would be impossible to draw justifiable conclusions from a sampling of a few "typical" States because of the variations from State to State. There are no typical States. Ideally, we should interview individuals from every State before attempting to prescribe for future action.

Conventional Survey Techniques

The ideal method of gathering the type of information we sought would have been face-to-face interviews with large numbers of persons. Unfortunately, we faced a shortage of the two elements essential for this method: time and money. It is not necessary to belabor these points; most researchers will readily recognize that it would be impossible for a staff of four to visit within a few months several hundred people scattered in various towns and cities in every State. If we could have divided the country into four areas with one staff member covering each, our purpose would not have been accomplished, since our staff members had different specialties and each of them had to interview people in every State. Also, the cost could have been prohibitive on our limited budget. There are, moreover, the inevitable delays caused by difficulties in transportation, missed appointments, and other unpredictable obstacles.

If sampling would not suffice, and face-to-face interviews on a nationwide basis were impossible, would a direct-mail questionnaire produce the desired results? The direct-mail questionnaire is the least expensive and often most efficient method of conducting a survey. The disadvantages, however, are well documented in research literature. Misinterpretation of the questions often leads to inaccurate replies. In addition, written comment is sometimes difficult to classify. An interviewer, on the other hand, can often discover patterns in comment

and thereby categorize the replies. About 60 percent response is the maximum expectation from this type of research. It is also far less effective than skillful interviewing for obtaining thoughtful comments in reply to open-end questions.

A questionnaire to solicit information about 52 dissimilar State and Territorial administrations would have to be both general and minutely detailed. Consequently, it would be so lengthy as to be enthusiastically ignored by most respondents.

Since our survey had to include questions requiring thoughtful comment as well as the "yes-no" and "how many" type of question, direct mail would have been a highly inadequate method of obtaining results.

But even more important was the fact that only a limited number of individuals in each State were sufficiently familiar with the programs to give us the information sought. Almost 100 percent response from every State was necessary for our survey to be comprehensive.

Thus an alternative method had to be devised—one that would cover the ground more adequately than either the sampling method or the direct-mail questionnaire, and at the same time cost less in time and money than face-to-face interviews on a nationwide basis.

Long-Distance Telephone Survey

The long-distance telephone call seemed to be the compromise we needed—a means of communication only slightly less direct than face-to-face interviewing and far less expensive. Actually, on analysis of survey results, we found the technique had many positive advantages of its own, but at the start we regarded it as a compromise.

We consulted the telephone company concerning arrangements for the undertaking and were given the following suggestions:

- Installation of special long-distance wires in order to avoid overloading the office switchboard. (There was a slight charge for these lines, but they more than proved their worth in time saved.)

- Use of a special "hands-free" set, consisting of a loud speaker and a microphone. A conventional receiver could be used, but it was

the method, together with cost comparisons. This is particularly true if the individuals to be interviewed have a stake in the project and feel that they have a right to an opinion regarding expenditure.

In our case, however, the telephone technique was heartily endorsed by our respondents almost unanimously. The interview required less of their time than a personal visit, yet the lengthy long-distance call emphasized the value of their opinions to the study. There was some comment to the effect that respondents' own interest in the subject had been intensified by the conversation, and that they welcomed the opportunity to evaluate and review the programs.

Conditions for Use

The technique obviously has its own positive values which under certain conditions make it preferable to any other. It may well be the method of choice for other studies under the following circumstances:

- A budget large enough to permit more exhaustive research than would be possible through a direct-mail questionnaire.

- Neither time nor money sufficient to permit visiting each respondent personally.

- Widely scattered geographic distribution of the persons to be interviewed.

- Great variation and complexity of questions, making written replies inadequate.

- The impossibility of making valid conclusions without an extremely high percentage of responses.

The long-distance telephone survey is suggested to supplement, not to supplant, other methods of gathering data. Many research projects will still be forced to rely on the mails as the most economical method. Others will require a rapport obtainable only by personal visit; "depth interviews," so popular at present, can hardly be held over the telephone. It is still impossible, and will be until telephones include built-in television, to pick up the shades of meaning implicit in the twinkle of an eye or the shrug of the shoulders unless you are facing your respondent.

But if your budget is sufficient, your time limited, your scope large, and your questions complex, it would be well for you to consider using the telephone as a research tool.

Days of Limited Activity Due to Disability

The total number of days which the American people stayed home from work, stayed in bed, or otherwise restricted their activities because of illness or injury has been estimated at 662,800,000 for July through September 1957, in a report issued by the U. S. National Health Survey of the Public Health Service. The report, which is the fourth in a series based on household interviewing, projects the rate of that quarter for the entire year to give an average of 16 days per person.

As of August 1957, the report estimates that about 17 million persons, or 10 percent of the population, had chronic conditions limiting their activities. Women and girls averaged 17.5 days of limited activity per year, compared with 14.1 for males. Children under 5 years of age averaged 6.4 days a year of restricted activity, while people 65 years and over averaged 44.4 days. The average time lost from work was estimated at 7.9 days for each employed person.

answers and comments on a duplicate copy. When answers seemed unclear, when it seemed that the respondent did not quite understand the question, or when the question asked did not fit the situation in that State, time was taken for thorough discussion. In some cases this resulted in a change of answer. For example, a few of the questions involved multiple choices representing varying degrees of opinion. After some discussion the respondent might decide that choice "c" was a closer approximation of his true opinion than his original choice of "b."

As each interview ended, the interviewer took time to write up or dictate his notes. These notes were then typed into the questionnaire itself, on pages facing the actual questions. Thus, we obtained a detailed record of the opinions expressed. However, no record was kept in any case where the respondent requested that he not be quoted.

We considered recording the conversations, but decided against it because of the time required to play them back completely, the distracting "beep" that punctures recorded conversation, and the inhibitions that would have precluded frankness from many people.

Using 2 "hands-free" sets in separate offices and sitting in on one another's calls as necessary, our 3 interviewers talked with 281 persons in 48 States and the District of Columbia, gathering responses to 567 questionnaires, in approximately 8 weeks. About 2 percent could not be located or declined to be interviewed.

The total cost of the calls to all the States came to \$4,703.17—just under \$100 per State, or about \$17 per individual interviewed. Of the total amount, \$17.05 was the charge for installation, \$133.76 the basic cost of the 2 special lines and the 2 speaker phones, and \$4,552.36 the charges for the calls including taxes.

Advantages

For this type of research, the advantages of the telephone technique over a direct-mail questionnaire are the same as those gained through the face-to-face interview: the almost total response, the accuracy and depth of the response, and the clarification which facilitates classification. In addition, the telephone interview overcomes one disadvantage of the face-to-face

interview: the great expenditure of time and money.

We estimated that for the total of \$4,703.17, in the 8 weeks spent in telephoning, we would have been able to visit in person only 10 western States, or about 80 individual respondents. (And this figure does not include the considerably greater payroll expenditure which the longer time span would have entailed.) The cost per person in this event would have been \$80, as compared with the \$17 actually spent.

Other more subtle advantages of this technique became apparent as we proceeded.

The telephone interviews were far more concentrated and free from both interruption and digression than the usual personal interview, since the awareness of the cost of long-distance telephoning exerted some pressure in this direction on both interviewer and respondent. (In no instance was the conversation interrupted by a phone call!)

Respondents had, for the most part, made more preparation in advance for answering the questions by telephone than is usually made in anticipation of a personal visit. In a number of cases respondents had even held conferences with other staff members or colleagues concerning the questionnaires.

The time between the first and last calls of the survey was less than probably would have elapsed from beginning to end of a direct-mail survey. (We used direct-mail questionnaires on some other phases of our study, and replies dribbled in for months.) The concentration of study on the part of the researchers into a shorter span of time contributes to more uniform evaluation of data, since it lessens the tendency to shift emphasis during the progress of the study.

Respondents' Reaction

The idea of indulging in such long telephone conversations for research purposes is unusual enough to be startling to the persons called. There was, in fact, some slight criticism of the generous outlay of funds in this manner. Although it was easily answered, the researcher who intends to employ this technique would be well advised to avoid such criticism by offering in advance a straightforward explanation of

In Routine Use

Stabilized antigen emulsion is now used at the Venereal Disease Research Laboratory in the routine performance of the VDRL slide, tube, and spinal fluid tests. A volume of antigen emulsion sufficient for approximately 1 week's testing is prepared and stored in the refrigerator at 6°–10° C. An aliquot sufficient for 1 day's testing is removed from the stock bottle, warmed to room temperature, and then checked with control serums for standard reactivity before use in testing individual serums. A new aliquot from the refrigerator is used each day.

—AD HARRIS, *Director,*
Venereal Disease Research Laboratory.

Four of these vials were stored at 37° C., and one vial was tested each week for 4 weeks. The remaining vials were divided into two groups. One group was stored at room temperature (23°–29° C.); the other was stored in the refrigerator at 6°–10° C. Samples of antigen from each group were tested periodically in comparison with an emulsion of standard reactivity, freshly prepared on the day of testing. A vial of stabilized antigen emulsion was used for at least 1 week if it retained its standard level of reactivity for that period of time. Antigen emulsions stored at 6°–10° C. were allowed to stand at room temperature for at least 30 minutes before use. When testing was completed they were returned to the refrigerator.

Samples of stabilized emulsions also were sent through the mail and, after 3 days in transit, were returned to the laboratory and tested for a period of 7 consecutive days when stored at 6°–10° C.

Results

The keeping qualities of the stabilized antigen emulsions prepared and handled as described are summarized in the table.

The stabilized antigen emulsions were satisfactory for use for 7 consecutive days after storage at 6°–10° C. for periods of 4 to 6 weeks. In one instance, an unopened vial was refrigerated for 4 months and found to be of standard reactivity when tested.

The stabilized antigen emulsions stored continuously at room temperature also retained their standard level of reactivity for relatively long periods, although storage at 23°–29° C. was not as satisfactory as refrigerated storage. Emulsions were satisfactory for use for periods varying between 2 and 4 weeks. Deterioration tended to occur more rapidly as temperatures exceeded these limits.

Emulsions were stored at 37° C. in order to determine the effect of the highest probable temperatures to which they would be exposed during shipment. When stored at this temperature in the incubator, they were found to be of standard reactivity after 2 weeks; however, slight but definite loss in reactivity was noted after 4 weeks' incubation.

The mailed specimens showed no change in reactivity during a period of 7 consecutive days of testing.

Comparative VDRL slide tests were also performed with stabilized and freshly prepared antigen emulsions (duplicates of each) on 570 serums selected at random from specimens submitted to this laboratory for testing. Stabilized emulsions were stored from 1 to 6 weeks at 6°–10° C. before use. Discrepancies in results obtained between the stabilized and freshly prepared antigen emulsions were not more numerous than those obtained with duplicate, freshly prepared antigen emulsions. In all instances, disagreements represented critical, borderline reactions, where the results might have been read either as rough nonreactors or as minimal weak reactors. Stabilized

Effect of storage time and temperature on reactivity of stabilized VDRL emulsions

| Storage method | Period of storage (weeks) | | | | | |
|-------------------------------|---------------------------|-----|-----|-----|-----|-----|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Refrigerator (6°–10° C.) | SR | SR | SR | SR | SR | SR |
| Room temperature (23°–29° C.) | SR | SR | SR | SR | LR | --- |
| Incubator (37° C.) | --- | --- | --- | LR | --- | --- |
| Mailed (3 days in transit) | ¹ SR | --- | --- | --- | --- | --- |

¹ Not tested beyond 7 consecutive days.

SR—standard reactivity; LR—less reactive than standard.

Method of Stabilizing Antigen Emulsion Used In VDRL Syphilis Tests

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ONE of the most important factors contributing to reproducibility of flocculation tests for syphilis is the ability to prepare antigen emulsions of uniform reactivity. Deviation from prescribed methods, use of reagents of poor quality, unclean glassware, and temperature variants may result in antigen emulsions of substandard reactivity.

The most widely used microflocculation tests employing cardiolipin antigen, described in the 1955 Manual of Serologic Tests for Syphilis (1), limit the use of antigen suspensions to the day on which they are prepared, or, as in the Kline standard test, to 48 hours.

A method whereby antigen emulsions of standard reactivity might be preserved for use in these tests would appear to be a valuable aid in promoting uniformity of test performance by eliminating the necessity of preparing them each day tests are performed, thus permitting their storage, shipment, and use over relatively long periods of time.

Antigen emulsions preserved for varying periods of time by the addition of preservatives or by storage at low temperatures have been used in other procedures. Hinton glycerinated indicator (1) can be used for at least 3 weeks when stored in the refrigerator. Chediak (2) added benzoic acid or beef albumin to cholesterolized alcoholic extracts of beef heart used to preserve emulsions in a microflocculation test on whole blood. Kurtz and Hill (3)

extended the use of a Kahn antigen emulsion to 36 hours by centrifugation and resuspension of the sediment in 0.9 percent saline. Modified antigen emulsions used by Rappaport and Eichhorn (4, 5) for several microflocculation tests were satisfactory for use for 2 weeks when stored on ice, and Portnoy and co-workers (6) modified VDRL antigen emulsion by centrifugation and the addition of choline chloride for use in a screening procedure and found that it could be used for 1 week if 0.01 percent merthiolate was added.

Investigative studies were undertaken at the Venereal Disease Research Laboratory to determine whether some of these reagents or procedures could be applied to the stabilization of antigen emulsions for the most widely used microflocculation procedures, such as the VDRL, Kline, and Mazzini tests, without affecting standard test reactivity level.

This report describes a method employing benzoic acid in the preparation of a stable antigen emulsion of standard reactivity for use in the VDRL slide, tube, and spinal fluid tests. Stabilized antigen emulsions prepared in this manner retained their standard level of reactivity during shipment and long storage periods, thus eliminating the necessity of preparing fresh antigen emulsions each day tests were performed.

Materials and Method

A stock 1.0 percent alcoholic solution of benzoic acid was prepared by dissolving 1 gm. of benzoic acid, reagent grade, in 100 ml. of absolute ethyl alcohol. This solution was stored in a glass-stoppered flask at 6°-10° C., and was satisfactory for use indefinitely.

VDRL antigen emulsion was prepared in 10.0 ml. volumes as described in the published method (1). To each 10.0 ml. volume of freshly prepared material, 0.1 ml. of stock 1.0 percent benzoic acid solution was added so that the final concentration of stabilizing substance was 0.01 percent. Each aliquot of this stabilized antigen emulsion was tested with control serums, and all those of standard reactivity were pooled. The pool was dispensed in convenient volumes of 5.0 ml. or 10.0 ml. into screw-capped vials.

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Silicosis, a Continuing Problem

VICTORIA M. TRASKO, A.B.

THE CONTINUANCE of silicosis in the United States reflects the cumulative effect on society of a preventable but still prevalent occupational disease. After more than 35 years of definitive research and almost as many years of application of controls in some measure, hazardous exposures still exist and new cases of silicosis are developing. The major impact of the disease today, however, is manifested as a socioeconomic problem.

To view the present state of the silicosis problem in proper perspective, I should like to mention some of the past developments that have bearing on the situation today.

Early Knowledge of Silicosis

Prior to the 20th century, the only intimation of silicosis in the United States was found occasionally in physicians' reports of lung diseases with a suspected occupational involvement (1). For instance, in 1887 an autopsy report on a stove foundry worker in Poughkeepsie, N. Y., described the cause of death as the condition that we know today as silicosis. Also in that year, a report appeared on 40 workers employed 25 years or more in a cutlery factory. Of the 34 men who had contracted what was referred to as a chronic disease of the air passages, 23 had died within the previous 10 years. A third report, which came out about 1900 in Utah, told of 30 men who had died following 1 to 2 years' exposure to dust from crushing

quartzite ore in a gold assaying mill in Nevada. The description of findings resembled very closely the characteristics of silicosis.

Entering the 20th century, we find a slow, steady awakening of interest in the health problems of dusty trades. The mechanization of certain stone and mining operations and, in particular, the introduction of pneumatic tools which generated substantial amounts of fine dust contributed to the rising incidence of silicosis and its complicating companion disease, tuberculosis. Evidence of excessive mortality from tuberculosis and relationship to dust exposure began to mount, as reflected in the occupational mortality statistics compiled by Dr. F. L. Hoffman of the Prudential Life Insurance Co. in 1907 and 1918 (1).

Concern over the large incidence of tuberculosis in the dusty trades gave rise to the first real investigation of the problem. The study was undertaken in 1913-15 in the lead and zinc mining industry around Joplin, Mo., by the Public Health Service and the Bureau of Mines (2). Of 720 lead and zinc miners examined, 45.7 percent were found to have silicosis and another 14.3 percent, silicosis complicated with tuberculosis.

Between 1920 and 1930, other environmental and clinical investigations of workers in dusty operations followed. Among these, an examination was made in 1920 by local physicians of 427 granite cutters in Barre, Vt. (1). Practically all of the group were found to have silicosis or tuberculosis alone or in combination. During 1924-26, the Public Health Service, in its study of the Vermont granite industry, found that practically all workers exposed to high concentrations of the dust developed the disease and that a large proportion eventually became tuberculous (3).

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emulsions were found to be equally satisfactory for use in the VDRL tube flocculation tests with serums and the VDRL tests with spinal fluid.

The use of benzoic acid as a stabilizing substance therefore did not appear to affect the reactivity level of the antigen emulsion for any of these three tests.

Discussion

During the course of these studies, other preserving substances and factors which might affect the relative stability of antigen suspensions were investigated. The presence of alcohol in these suspensions and its possible effect on their stability were considered, since it has been observed that in some instances emulsions containing no alcohol deteriorate less rapidly than those containing alcohol. Alcohol was removed from VDRL antigen emulsions by dialysis, or by centrifugation at $20,000 \times g$. and resuspension of the sediment in VDRL buffered saline. Both methods, however, resulted in preparations that were less reactive than standard.

The use of proteins as stabilizing substances for colloids and oil-in-water emulsions is well known. Bovine albumin in varying concentrations was added to VDRL emulsions, but in all instances these preparations were undersensitive and showed evidence of contamination after 1 week's storage at 6° – 10° C.

Glycerin, too, is a substance commonly used to stabilize emulsions by decreasing surface tension. In addition, as previously indicated, it is used in the preparation of Hinton glycerinated indicator which can be used for 3 weeks. Addition of glycerin to VDRL emulsions, however, either affected their standard reactivity level, or, when used in low concentration, did not preserve them for any significant period of time.

The use of various salts of the fatty acids, such as the stearates, oleates, and palmitates, was also considered. None of these substances, however, was available as a reagent grade chemical readily soluble in either water or alcohol; they were therefore not used.

Of all the substances tested, benzoic acid proved to be the most satisfactory for stabiliz-

ing VDRL antigen emulsions. It was readily available as a reagent grade chemical, a 1.0 percent stock solution was stored and used for long periods of time without deterioration, and an extremely low concentration (0.01 percent) was effective in preserving the standard reactivity level of the emulsions for long periods of time.

Preliminary studies have also been carried out using benzoic acid as a stabilizing substance for preserving the standard reactivity of antigen suspensions used in the Kline standard and Mazzini microfloculation tests. Results obtained with both these procedures will be reported later.

Summary

A procedure employing benzoic acid as a stabilizing substance for preserving the reactivity level of antigen emulsions for use in the VDRL tests is described.

The reactivity of the stabilized emulsions varied according to the temperature at which they were stored and the length of time they were kept.

Comparative results obtained on 570 serums tested with freshly prepared and with stabilized emulsions in the VDRL slide test indicated that benzoic acid does not affect reactivity, levels.

Of several stabilizing substances tested, benzoic acid was the most satisfactory.

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X-rayed periodically who were initially exposed after the installation of dust controls from 1937 to 1939 (8).

The transition to dust control, however, was not as universal or as rapid as some like to believe. During the war years, 1941 to 1945, ventilation equipment was scarce and was released on a priority basis, mainly to war production industries. Studies in Georgia, for example, revealed that as late as 1948 some granite sheds and quarries had silica exposures many times in excess of recommended limits (9).

The job of educating the smaller employers in preventive techniques was far from complete. As late as 1953 a death from acute silicosis, confirmed by histological examination, occurred in one of the States. The worker, 24 years old, had had 5 years of exposure in a small plant making cleansing powder which was 100 percent pure "flour of silica." The 18 dust samples collected by industrial hygiene personnel were all above 16 million particles per cubic foot of air, with counts reaching 770 million particles. The owner had no idea of the hazardous nature of his business and had taken no preventive measures. After official investigation, the plant was closed.

Since the war years, many research advancements have been made which in retrospect have been helpful in shedding more light on the epidemiology of dust diseases. The impression of the late 1930's carried into the 1940's, that the dust problem was largely solved, was on the wane by the 1950's. New uses of silica and its byproducts (10), more widespread mechanization of dusty operations, and technological advances gave rise to the suspicion that possibly new types of exposures were occurring.

The present-day concern with silicosis as a continuing problem led in 1956 to a series of Congressional hearings on safety and health in metal mines (11). This is the second time that Congressional hearings have focused primarily on silicosis as an occupational health hazard.

Prevalence of Silicosis in the United States

Despite all the interest, research, and activity since the 1930's, the precise prevalence of dust diseases remains a mystery. In 1933, Lanza and Vane presented a paper entitled "Prevalence of Silicosis in the General Population and Its Effects Upon the Incidence of Tuberculosis" (12). The status of the disease was disclosed in the first four sentences of the paper. "I wish to make it perfectly clear that there is little in this paper to justify its ambitious title. Silicosis is not a reportable disease. It is still commonly not diagnosed. Even in districts where it prevails, it does not appear on death certificates to the extent which one might expect."

On the basis of various investigations, the authors estimated conservatively that 500,000 workers were then exposed to a harmful degree of silica dust in the United States. Various other estimates, including the projected figures of the Public Health Service (13), established a total silica-exposed population of between 1,500,000 and 2,000,000. Cummings, at the Fourth Saranac Laboratory Symposium on Silicosis in 1939, ventured a guess that about 50,000 employed workers at that time might be found with definite evidence of silicosis (14).

On the assumption that these estimates are valid, the outlook for silicosis as a continuing problem is rather foreboding. Taking the 1933 estimate of 500,000 harmfully exposed workers and applying the then prevalent ratio, of 1 out of every 4 exposed as eventually developing the disease, we arrive at a figure of 125,000 potential silicotics. Even Cummings' guess of 50,000 workers with silicosis in 1939 would impose on today's society a burdensome residue of persons who had acquired silicosis earlier.

In 1955, because of numerous requests for statistics and the mounting reinterest in silicosis, the Occupational Health Program of the Public Health Service began a search for prevalence data in the States. I shall refer only briefly to the results of this study, published in 1956 (15).

By putting together the piecemeal information obtained from official agencies, we arrived at a total of 10,362 cases of silicosis on record in 22 States between 1950 and 1954. They included open and settled compensation cases, cases discovered through X-ray examination of workers in dusty trades, reports by physicians, and some death records. Since then we have added to this total, so that we now have some information on 12,763 cases in 26 States, cover-

A 1928 study by the New York Department of Labor revealed that 57 percent of 208 workers engaged in rock tunneling in New York had silicosis (4). Similar studies and investigations by various groups were carried out in metal grinding, abrasives grinding, porcelain enameling, and in the sandstone and cement industries. In operations where a dust exposure was evident, incidence of silicosis ranged as high as 67 percent. Studies of this type continued into the 1930's, providing ample evidence of the severity of the dust hazard in certain industries and the dire need for dust control measures.

Developments of the 1930's

Despite the steady buildup of incriminating information, not until the 1930's was silicosis generally recognized as a serious occupational health hazard. The awakening was precipitated by a tidal wave of lawsuits in civil courts based both on legitimate and spurious claims of dust disease due to the occupation. Had these claims prevailed, it is alleged, many of the affected industries and insurance companies would have gone bankrupt. In 1933, alone, it was estimated that damage suits of more than \$100 million were outstanding (5). The grounds for lawsuits were negligence of the employers, since at that time only six States, by so interpreting the term "personal injury," could compensate for silicosis under their laws.

Several factors undoubtedly contributed to this wave of lawsuits. For one thing, a sufficient number of years had elapsed to build up a sizable silicotic population. For another, the Nation had been plunged into an economic depression and silicotic workers were seeking some form of financial compensation for their illness. Another probable reason was the impact of the lag in the application of dust control techniques already developed through scientific research. The lawsuits disclosed that the knowledge of these was not widespread. Employers claimed that they had not been fully informed or warned of the special dangers of certain dusts and, therefore, exercised only general care in prevention which they thought was adequate.

Among other widely publicized events of

the 1930's was the Gauley Bridge disaster in West Virginia. Congressional hearings held in 1936 revealed that 476 workers died from silicosis and 1,500 others were suffering from the disease they contracted while digging a rock tunnel for diverting water to a hydroelectric plant during 1932-34 (6). No safeguards of any kind were used to control the exposures to rock dust, which was almost pure silica.

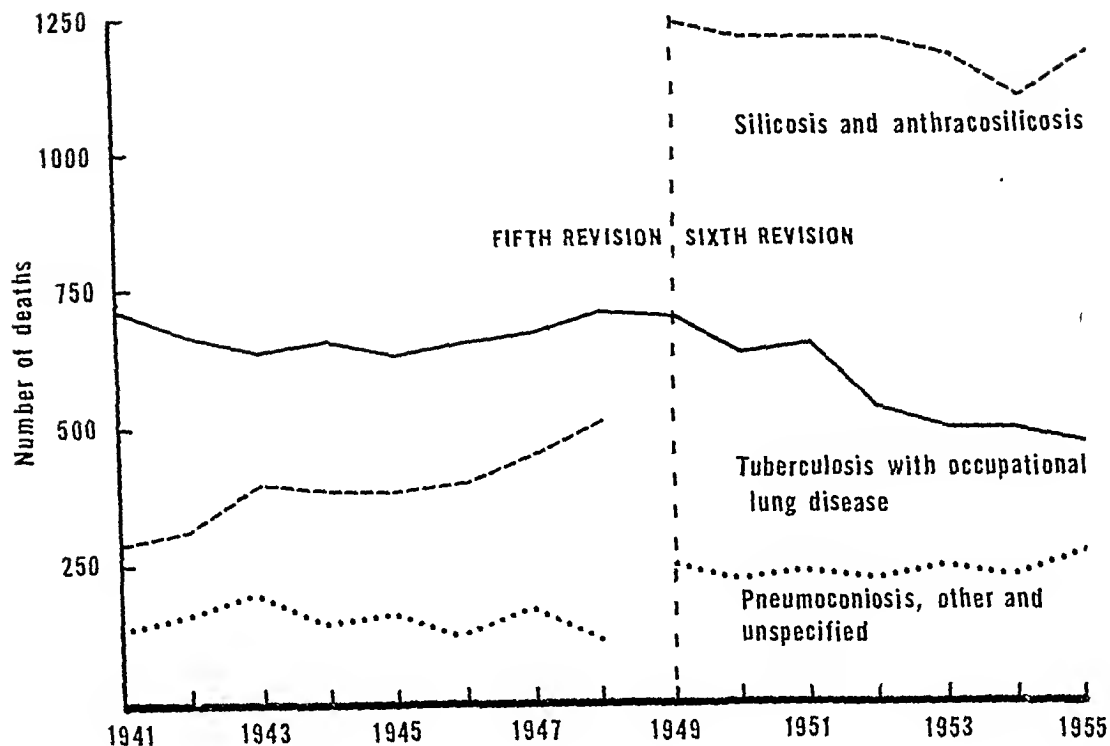
Working and living conditions among lead and zinc miners in the Joplin, Mo., area continued to be publicized by commentators and writers. Among these was Dr. Alice Hamilton with her article *A Mid-American Tragedy* (7), published some 25 years after the first silicosis investigation was made in the Joplin area. In Massachusetts and New York, commissions were appointed to investigate hazardous conditions in foundries, granite sheds, and other dusty industries.

These and other events of the 1930's catapulted silicosis from relative obscurity into widespread notoriety and spurred the taking of long awaited action. For example, nine States passed legislation bringing silicosis under the compensation laws between 1933 and 1939. By 1949, the number of States making some legal provision for compensation of silicosis reached 40. The First Saranac Laboratory Symposium on Silicosis was held in 1934, and the National Conference on Silicosis in 1936.

Only three States, Ohio, New York, and Connecticut, had industrial hygiene programs prior to 1934, but with the help of Social Security funds, 26 State and city governments established industrial hygiene programs from 1936 to 1939. Several insurance companies also instituted activities for the prevention and control of occupational diseases for the employers they insured.

In a less dramatic vein, industry began the task of controlling and eliminating hazardous dust conditions. The high degree of success achieved by these efforts is unquestionable. One instance is exemplified in the recent follow-up study of the Vermont granite industry by the Public Health Service and the Vermont Industrial Hygiene Division. Dust counts were found within recommended limits and no evidence of silicosis was detected among men

Figure 1. Deaths from pneumoconioses in the United States, 1941-55.



of almost 2,000 per year (16). Tuberculosis with mention of occupational disease of the lung accounted for 28 percent of the 11,650 total; silicosis and anthracosilicosis for 60 percent; and unspecified and other pneumoconioses for 12 percent. The 12 percent includes a small number of deaths from asbestosis and anthracosis; however, most are unspecified pneumoconioses and are probably silicosis.

It is not possible to determine to what extent mortality from dust diseases in the United States has increased or decreased over the past years. Figure 1 presents the number of such deaths since 1941. However, prior to 1949, a fixed system of priorities was used in selecting the cause of death to be tabulated. With the sixth revision of the International List of Causes of Death, the cause of death tabulated was, in general, that designated by the certifying physician as the underlying cause of death. This change in coding rules has therefore increased the number of deaths assigned to pneumoconioses since 1949.

The graph suggests, however, that the number of deaths due to tuberculosis with mention of

occupational disease of lungs has been gradually decreasing. The trend for silicosis and anthracosilicosis shows a rise for the first coding period and a level plateau for the second period. It is believed that the calculation of rates, even if the exposed population were known, would not materially affect this picture. If increases in employment in the manufacturing industries and decreases in mining are taken into account, the number of workers in dusty trades probably has not changed appreciably over the 1941-55 period. The steady rate at which the silicotic population is dying off gives us a fairly good idea of the extent of silicosis today and in retrospect.

Deaths from pneumoconioses in Pennsylvania accounted for 40 percent in 1953 and 45 percent in 1954 of all such coded deaths in the United States. For this reason, Pennsylvania death certificates were used to obtain further information. With the aid of the National Office of Vital Statistics, we scanned 137,000 death certificates covering January, February, and March 1953 (a trial period), and the entire year 1954. Information was transcribed on age,

ing from 2 to 6 years of records between 1950 and 1955.

When we began our inquiries, we were aware of the impracticability of developing conclusive evidence. But, by accumulating data on a sufficiently large number of cases, we hoped to come up with some general answers.

We found that, in addition to the present silicotic population being sizable, it is primarily an elderly one. Only 2.5 percent of the cases are under 35 years of age; 21 percent are between 35 and 49 years; and the remaining three-fourths, 50 years and over. Since most of our data are for compensable cases representing primarily a disabled group, this distribution may be biased. Records of workers with nondisabling silicosis are scarce, as the disease is under-reported, and very few States compensate for partial disability from it. When partial disability is compensable the proportion of cases of persons under 50 years of age tends to be higher. In West Virginia, for example, it was 35 percent and in New Jersey 55 percent. In States compensating for total disability only, such as Montana and New York, 4 and 15 percent respectively of the cases involved workers under 50 years of age.

The mining industries, coal, metal, and non-metal mining and quarrying, were associated with two-thirds of the cases. Of the manufacturing industries, foundries were associated with 16 percent, and pottery, stone, silica-brick, tile, clay, and glass industries with the remaining 18 percent.

The age distribution by industry showed in each group some cases among men under 35 years of age. However, none of the case totals for the under 35-year-old group exceeded 5 to 9 percent of the industry's total cases. The 50- to 64-year-old group accounted for most cases within each industry as well as for all industries combined.

Another revealing fact was the number of new cases among workers entering dusty trades for the first time since 1935. Of 3,455 cases in 10 States for whom reasonably adequate employment histories were obtained, 10 percent allegedly received their entire dust exposure after 1935. The distribution of these cases by industry shows every group produced at least a few, but that the mining industries, foundries,

and nonmetallic mineral industries were responsible for over one-half of the recent cases.

Our data on pulmonary tuberculosis as a complication of silicosis are not satisfactory since not all States record or tabulate the condition. This is especially true for compensation cases, despite the fact that tuberculosis accounts for most of the disability. Proportions of silicosis cases with tuberculosis reported in a few States are: 34 percent of 111 litigated cases in California; 30 percent of 637 open and closed compensation cases in Ohio; 62 percent of 507 hospital clinic cases and deaths in Missouri; 53 percent of 318 clinic cases in Oklahoma; 12 percent of 162 workers X-rayed in North Carolina; and 24 percent of 723 workers X-rayed in Vermont.

These data give the impression that pulmonary tuberculosis is not as damaging to health of silicotics as it once was, and even with the complication many silicotics live to old age. For example, men with simple and complicated silicosis had the same average age, 56 years, and length of employment, 32 years, according to X-ray examination records of Vermont granite shed workers living during 1950-55. Workers deceased during the same period were, on the average, 6 years older than those in the living group. The only other difference observed was that the persons in the deceased group who also had tuberculosis had worked an average of 4 years less.

This summarizes the few general facts we were able to glean from records on the nature and extent of silicosis in the United States. The current figure of 12,763 cases reflects the extent of our success in collecting statistics on silicosis rather than serving as a measure of prevalence. As such, it is a gross underestimate, owing to the incompleteness of sources of data and lack of statistics for other States with silica hazards.

Mortality Statistics

Further proof of the inadequacy of our so-called prevalence figure lies in mortality statistics of the National Office of Vital Statistics. About 20 percent of the 12,763 cases on record in 26 States during 1950 to 1955 were known to have died. In the entire United States over the same period, 11,650 deaths were recorded as due to occupational pneumoconioses, or an average

cosis costs for varying periods between 1950 and 1955 ranged from \$2,232,000 to \$12,608,000. In the other 12 States (Arkansas, California, Colorado, Idaho, Illinois, Nevada, New Jersey, North Carolina, Utah, Virginia, Wisconsin, and Washington) the spread was from \$78,116 to \$795,431.

Compensation for silicosis is a slow, costly, and complicated business. Requirements for eligibility, determination of liability, assessment of disability, amounts of awards, and methods of processing cases differ tremendously from State to State. In the group of 18 States, the average cost per case ranged from \$1,390 in West Virginia to \$16,180 in New York. Individual payments were as low as \$380 for temporary disability in New Jersey and \$1,000 for stage 1 silicosis in West Virginia and as high as maximum indemnity awards of \$12,000 in Utah, and more than \$20,000 in States with unlimited benefits such as Ohio. When medical benefits are added, costs of some cases exceed \$30,000 each.

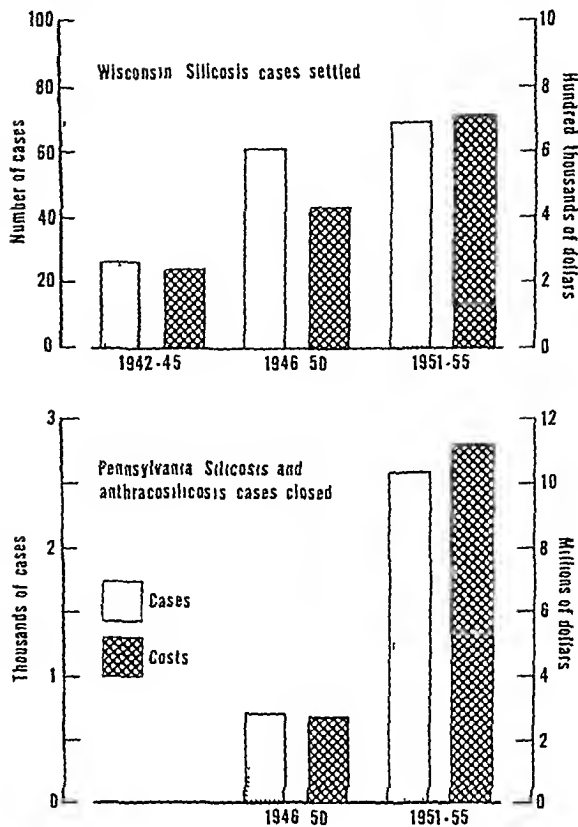
The average cost per case for the 18 States combined is \$4,450. In contrast, the average cost of compensation claims for all work injuries in the United States ranged from a low of \$843 in Alabama to a high of \$1,055 in Montana (17).

Data on compensation costs for earlier years are scarce. Lanza reported that claims for silicosis compensated in 1938 and 1939 average 10 to 12 per year in the industrialized States (14). Up to that time legislation was comparatively new and not widespread. The few States then reporting costs, Wisconsin among them, found that dust diseases accounted for one-third to more than 90 percent of all the occupational disease costs.

The experience of two States, Pennsylvania and Wisconsin, which have published continuous data, shows that costs since 1950 have increased substantially (fig. 2). This is typical of what has probably occurred in many other States. One of the many reasons for the increased claim load is that most of the occupational disease compensation laws were passed after 1940, and since 1950 many have been liberalized.

These figures, impressive as they may be, cover only a fraction of the costs and burdens

Figure 2. Compensation costs in two States.



on today's society of the accrued liability of preventable disease. Countless numbers of true silicotics not legally eligible for compensation are forced to turn elsewhere for help. If restrictions in laws were lifted, the costs would undoubtedly skyrocket to unforeseen proportions.

Conclusions

This, in brief, sums up the evidence we have on silicosis as a continuing problem. The majority of cases on record represent disabled workers and a backlog of early acquired silicosis. The major impact on society is an economic one as reflected in high compensation costs.

The true extent of nondisabling silicosis cannot be determined from official records as yet. There is sufficient evidence, however, to suggest that this group of not yet discovered or disabled silicotics may be important in perpetuating the silicosis problem. There is also evidence of need

occupation, and causes of death for all certificates giving silicosis, anthracosilicosis, or pneumoconiosis as a primary or contributory cause of death.

In this manner, we obtained a population of 1,519 deaths among silicotics for the 15-month period. Pneumoconiosis as a primary cause of death was assigned officially to 60 percent of this 1,519 total; other causes of death were assigned to 40 percent. Thus, 2 out of every 5 deaths among silicotics were attributed to other causes.

Although uncomplicated silicosis is showing up on death certificates with relatively greater frequency, it is still commonly omitted. For instance, in another State where I had access to the compensation files, silicosis was not mentioned on 42 out of 269 death certificates filed with the claims, although the majority of these cases had received disability benefits for many years prior to death.

The causes of death on the 1,519 death certificates were tabulated to determine what other conditions are associated with these deaths. After several futile attempts at multiple-cause coding, the tabulation shown in the table emerged. It is offered for whatever it may be

Frequency of other conditions mentioned on 1,519 death certificates listing silicosis, anthracosilicosis, or pneumoconiosis as a primary or contributory cause of death, January-March 1953, January-December 1954, Pennsylvania

| Condition | Number | Percent |
|---|--------|---------|
| Only silicosis, anthracosilicosis, or pneumoconiosis mentioned..... | 218 | 14.4 |
| Respiratory tuberculosis..... | 143 | 9.4 |
| Cancer, respiratory system..... | 50 | 3.3 |
| Cancer, other sites..... | 58 | 3.8 |
| Cerebral hemorrhage, thrombosis..... | 67 | 4.4 |
| Heart and other disease of circulatory system..... | 861 | 56.7 |
| Bronchial asthma..... | 67 | 4.4 |
| Influenza, pneumonia, bronchitis..... | 139 | 9.2 |
| Ulcer, hernia, cirrhosis of liver, and other disease of digestive system..... | 60 | 3.9 |
| Nephritis and other disease of genitourinary system..... | 57 | 3.8 |
| Accidents..... | 10 | .7 |
| Cor pulmonale..... | 236 | 15.5 |
| Emphysema..... | 89 | 5.9 |
| Pulmonary hemorrhage..... | 35 | 2.3 |
| Pulmonary edema..... | 61 | 4.0 |

worth; I have made no attempt to interpret it.

An age distribution showed that none of the deceased was under 40 years of age at the date of death; 5 percent were between 40 and 49 years old; 39 percent between 50 and 64 years; and 56 percent over 65 years. There were more deaths under 65 years of age among those who also had tuberculosis, 59 percent, than among the others, 43 percent. In our prevalence study we reported that individuals with silicosis are living a relatively full life span.

By occupation, 76 percent of the 1,519 deceased were miners. Coal mining was specified occasionally, but rarely was it described as anthracite or bituminous. Occupations for the remaining were: foundry or steelwork, 6 percent; stonecutting, quarrying, brickmaking or other work associated with silica exposures, 2 percent; painter, electrician, repairman, truck-driver, watchman, restaurant worker, clerk, farmer, or other occupations not associated with silica exposures, 9 percent; and laborer not otherwise specified, retired, or not known, 7 percent.

Compensation Costs

The most forceful evidence we have of silicosis as a continuing problem is what the disease costs society today. The compensation costs of 9,829 cases on record between 1950 and 1955 in 18 States amounted to \$43,693,000. This amount covers benefits paid on open cases up to 1954 or 1955 and awards allowed or paid in death cases. It covers a 6-year period for 4 States, a 5-year period for 9 States, and between 2 to 4 years for 5 States. Medical costs are not consistently included or reported. Making allowances for incompleteness of information and allowing for costs in other States for which data were not available, compensation costs of silicosis cases outstanding since 1950 can be estimated to be at least 10 million dollars per year. In contrast, the budgets of official industrial hygiene agencies for the entire country amount to less than 3 million dollars annually. These agencies are responsible for the control and prevention not only of silicosis but also all other occupational diseases.

In 6 States (Alabama, Montana, New York, Ohio, Pennsylvania, and West Virginia) sili-

Topical Applications Of Sodium Fluoride And Stannous Fluoride

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SODIUM FLUORIDE applied topically to the teeth gives approximately 40 percent reduction in the incidence of dental caries in children (1-3). Other fluoride compounds may be even more effective. Laboratory studies suggest that stannous fluoride is superior to sodium fluoride in reducing the solubility of powdered dental enamel (4-6) and whole tooth sections in weak organic acids (7), and experimental studies in hamsters (8) and rats (9-11) have corroborated these findings. Also, there are reports of approximately 60 percent reduction in dental caries in children when stannous preparations were used (12-14).

The present study has tested further the effectiveness as dental caries preventives of 2 percent stannous fluoride and 2 percent sodium fluoride. Nearly 600 children 9-14 years old in Milwaukie and Oregon City, Oreg., participated in all phases of the 16-month study. The children were divided into two comparable groups, one group receiving stannous fluoride and the other sodium fluoride.

Materials and Methods

In Milwaukie and Oregon City, Oreg., a questionnaire was sent to the parents of all children in grades 4 through 9. The questionnaire was used to obtain parental permission for the children to take part in the study and to identify children who had had previous exposure to fluoride. The parents of 69 percent of the children in the 5 grades requested that their children participate in the study. All these children were included except those whose questionnaires indicated that they had previously received topical fluoride applications or had lived at some time in an area having more

than 0.3 ppm of fluoride ion in the water supply. The fluoride content of the public water supply in Milwaukie was 0.25 ppm; in Oregon City, it was 0.20 ppm.

The names of 690 children who were to participate were listed alphabetically by age and sex. Every other child was assigned to one treatment group and the remainder to a second treatment group. In alternate children within each of these groups, the right quadrants received the treatment, and in the remainder, the left quadrants. No selection was made on the basis of caries susceptibility.

A dental prophylaxis was given prior to the initial examination. All examinations were made in December 1955 by the authors, with No. 4 plane mouth mirrors and No. 23 single-end explorers under artificial light. Portable dental chairs were used. Compressed air was applied routinely to each quadrant during examination.

Both fluoride solutions were applied four times by the same dental hygienist, using the method described by Knutson (15). The treatments were begun in January 1956 and completed within 4 months. One group of children received a 2 percent aqueous, unbuffered sodium fluoride solution. The other group received a 2 percent aqueous, unbuffered stannous fluoride solution. In all children, the solution being tested was applied to one side of the mouth, and distilled water to the other side. Celluloid strips were used between the central incisors, both upper and lower, to help prevent the fluoride solution from contacting the untreated side. The sodium fluoride solution was prepared daily. The stannous fluoride solution was prepared hourly with oxygen-free distilled water, since it deteriorates rapidly (16, 17).

Dr. Nevitt was regional dental consultant for the Public Health Service in Region 9, San Francisco, when this study was conducted. He is currently on a 1-year assignment as dental health adviser with the World Health Organization in its Eastern Mediterranean Regional Office, Alexandria, Egypt. Dr. Witter is director of the dental health section, Oregon State Board of Health, Portland, and Dr. Bowman, formerly a dental officer with the Public Health Service in Region 9, is now in private practice in Richmond, Calif.

for more support for preventive activities by official agencies. Prevention is still cheaper than compensation.

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The Work of WHO, 1957. Annual report of the Director-General. Official Records of the WHO No. 32; 1958; 183 pages; \$1.25.

The First Ten Years of the World Health Organization. 1958; 538 pages; \$5.00.

These publications may be obtained directly or through a bookseller from the Columbia University Press, International Documents Service, 2960 Broadway, New York 27, N. Y.

Table 3. Percentage fewer newly carious teeth and tooth surfaces during a 16-month period in permanent teeth of fluoride-treated mouth quadrants of 588 children, Milwaukie and Oregon City, Oreg.

| Fluoride solution | Percentage fewer newly carious teeth | | | Percentage fewer newly carious surfaces of previously carious teeth | | |
|------------------------|--------------------------------------|------------|-------------|---|------------|-------------|
| | Upper arch | Lower arch | Both arches | Upper arch | Lower arch | Both arches |
| Stannous fluoride..... | 46.3 | 41.3 | 44.4 | 9.1 | 11.8 | 10.4 |
| Sodium fluoride..... | 33.5 | 40.6 | 35.9 | 5.4 | 15.5 | 10.3 |

than among the untreated teeth regardless of the fluoride solution used.

In the upper arch, a smaller proportion of caries-free permanent teeth became carious after treatment with stannous fluoride than after treatment with sodium fluoride. This difference is statistically significant. In the lower arch, the proportion of caries found in teeth treated with stannous fluoride is not significantly different from the proportion in those treated with sodium fluoride. Neither is there a significant difference in caries incidence between the two types of treatment when the data for both arches are combined.

The reduction in the incidence of dental caries on tooth surfaces of previously carious teeth was not significant for either the sodium or stannous fluoride solutions.

As long as 4 months elapsed between the initial examination and the beginning of treatment of some children. If each child had received treatment immediately following examination, the demonstrated effectiveness of the fluoride solutions might have been greater than that observed in this study.

Summary

Two groups of school children 9-14 years of age were given topical applications of stannous fluoride and sodium fluoride to test the effectiveness of these preparations as dental caries preventives. One group was treated with a 2 percent stannous fluoride solution and the other with a 2 percent sodium fluoride solution. The upper and lower quadrants on one side of the mouth were treated, and the quadrants on the other side served as controls.

Analysis of data on 588 children reexamined 16 months after the initial examination indicated that:

1. The incidence of dental caries in permanent noncarious teeth was significantly lower in mouth quadrants treated with either stannous fluoride or sodium fluoride than in untreated quadrants.

2. The findings relative to the comparative effectiveness of stannous fluoride and sodium fluoride were inconclusive.

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Table 1. Age distribution of 588 children available for reexamination at the end of a 16-month period, Milwaukie and Oregon City, Oreg.

| Fluoride solution ¹ | Number of children by age (last birthday) at time of first examination. | | | | | | |
|--------------------------------|---|----|----|-----|-----|-----|----------|
| | 9 | 10 | 11 | 12 | 13 | 14 | All ages |
| Stannous fluoride..... | 29 | 19 | 21 | 71 | 66 | 84 | 290 |
| Sodium fluoride..... | 35 | 23 | 18 | 58 | 76 | 88 | 298 |
| Total..... | 64 | 42 | 39 | 129 | 142 | 172 | 588 |

¹ All children received four applications.

Of 671 children treated in the study, 588 were available for reexamination in April 1957, 16 months after the first examination. Of these 298 were treated with sodium fluoride and 290 with stannous fluoride. Each of the dentists examined the same children he had examined originally. Equipment and procedures used for the reexamination were identical with those of the first examination. New record cards were prepared so that the examiner would not know the results of his first examination nor which solution had been used. A prophylaxis was given before the second examination to remove any stains that might have developed from the application of stannous fluoride.

In this discussion, analysis of the data on caries experience is confined to the erupted per-

manent teeth seen at the time of the initial examination. The age classification refers to the age (last birthday) at the time of the first examination (table 1).

Results

The caries experience of the 588 children available for the second examination is shown in table 2, and the percentage reduction in the incidence of newly carious teeth and of carious surfaces in previously carious teeth is given in table 3.

Of 1,087 upper permanent noncarious teeth treated with stannous fluoride, 131, or 12 percent, became carious. In the untreated quadrants, 244 of 1,084 teeth, or 23 percent, became carious. The proportion of teeth that became carious is significantly lower among the treated than among the untreated teeth.

Of the 1,103 upper permanent noncarious teeth that were treated with sodium fluoride, 171, or 16 percent, became carious. Again, the proportion of treated teeth that became carious is significantly lower among the treated than among the untreated teeth.

There were more noncarious permanent teeth in the lower arch of the 588 children than in the upper arch, and a smaller percentage of the teeth in this arch became carious whether treated or not. However, in the lower arch as in the upper one, the proportion of newly carious teeth is significantly lower among the treated

Table 2. Dental caries experience during a 16-month period in permanent teeth of fluoride-treated and untreated mouth quadrants of 588 children, Milwaukie and Oregon City, Oreg.

| Treatment groups, by treated and untreated quadrants | Number of noncarious teeth, December 1955 | Newly carious teeth, April 1957 | | Carious surfaces in newly carious teeth | Newly carious surfaces in previously carious teeth | Total newly carious surfaces |
|--|---|---------------------------------|---------|---|--|------------------------------|
| | | Number | Percent | | | |
| Stannous fluoride: | | | | | | |
| Treated upper quadrant..... | 1,087 | 131 | 12 | 175 | 221 | 396 |
| Untreated upper quadrant..... | 1,084 | 244 | 23 | 320 | 243 | 563 |
| Treated lower quadrant..... | 1,261 | 88 | 7 | 119 | 186 | 305 |
| Untreated lower quadrant..... | 1,247 | 150 | 12 | 214 | 211 | 425 |
| Sodium fluoride: | | | | | | |
| Treated upper quadrant..... | 1,103 | 171 | 16 | 237 | 192 | 429 |
| Untreated upper quadrant..... | 1,105 | 257 | 23 | 343 | 203 | 546 |
| Treated lower quadrant..... | 1,317 | 79 | 6 | 112 | 161 | 276 |
| Untreated lower quadrant..... | 1,312 | 133 | 10 | 171 | 191 | 365 |

The Public Health Program for Mexican Migrant Workers

NORMA J. ROBINSON

CONTINUAL EFFORT has been made by the Public Health Service to identify the health problems and to establish specific health requirements for migrant laborers coming into this country.

Of the 1¼ million migrant laborers employed in agriculture in the United States, approximately one-half million are foreign nationals, principally from Mexico. The Mexican component is about 450,000. Those who are recruited in Mexico for brief periods of time to meet a specific need are called *braceros* (from the Spanish word for "arm"). During 1957, *braceros* were employed in 27 States, ranging from California on the west coast to Delaware in the east.

The program for employment of foreign labor in the United States requires that each worker pass a physical examination. Today, the Public Health Service has developed a procedure for screening large numbers of laborers in a relatively short period of time.

Early Recruitment

Mexico has been a source of labor for the United States for many years. For a long period, however, this recruiting was unsupervised. Workers were brought in without adequate guarantees as to employment, housing, sanitary conditions, and wages. The working conditions and ultimate economic status of many of the Mexican laborers in the United

States became a serious problem for this country and for Mexico. Particularly during the period of economic depression following 1929, distress was general among the Mexican residents in the United States; consequently, many of the laborers returned to Mexico in various degrees of destitution. The Mexican Government was therefore prompted to incorporate in the Mexican Federal Labor Law of 1931 definite regulations governing the migration of Mexican workers, and the Mexican Constitution outlined these workers' rights, including compensation for injuries or illnesses and the guarantee of return transportation for workers given contracts for employment outside the country (1a). This official act had a marked impact on the emigration of laborers and the establishment of standards for the employment of Mexican agricultural workers.

Historically, the Division of Foreign Quarantine of the U. S. Public Health Service has had specific responsibility for preventing the introduction of quarantinable and other dangerous and contagious diseases into the United States and for preventing the entry of aliens with mental and physical conditions excludable under the immigration laws. Prior to World War II, medical inspections of Mexican nationals entering the United States were performed at the ports of entry along the Mexican border. For the temporary visitor, the medical inspection was rather cursory. However, it appears that particular attention was given to inspecting for pediculosis to prevent the introduction of typhus fever, and disinfection was frequent. Mexican nationals were permitted to

Miss Robinson is a management analysis officer, General Methods Staff, Office of the Surgeon General, Public Health Service.

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Institute of Perinatal Casualties

An institute on perinatal casualties will be held jointly on December 8-12, 1958, by the University of Michigan School of Public Health and the University of Minnesota School of Public Health in Minneapolis, Minn. Michigan and Minnesota State maternal and child health and crippled children's agencies are also sponsors.

The institute will consist of a series of seminars and discussions on such aspects of perinatal casualties as definition, extent and significance; etiology; prevention; growth and development; coordination of services; mortality studies; care of the premature infant; specialized programs, such as mental retarda-

tion, cerebral palsy, and congenital heart disease; and program planning and evaluation.

Each State in Regions V and VI may select, at least four staff members (two each from MCH and crippled children's programs) to attend the institute. Travel expenses, tuition, lodging, and meals of each person selected will be financed by the U. S. Children's Bureau.

For further information Region V applicants should contact Dr. Donald C. Smith, University of Michigan School of Public Health, Ann Arbor, Mich., and Region VI applicants should contact Dr. Helen M. Wallace, University of Minnesota School of Public Health, Minneapolis, Minn.

United States illegally obviously could not have been examined.

In 1949 the international executive agreement between Mexico and the United States included a significant change which seriously affected the medical examination of Mexican laborers. Under this agreement, laborers illegally in the United States could be recruited and contracted for agricultural work. Subsequent recruiting of wetbacks in the United States was carried out sporadically in scattered areas to meet the labor needs of particular localities. Under these conditions, the Division of Foreign Quarantine could not make complete examinations for tuberculosis. Although the Service could not conduct a comprehensive medical examination program for the illegal entrants, laborers who were recruited in Mexico were given medical examinations at the designated ports of entry, according to the terms of the 1949 agreement.

Legislative Authority

For several years the Mexican Government had been seeking agreements which would prevent the illegal exodus of Mexican workers and protect, with respect to wages and working conditions, its citizens employed in the United States. To insure that the United States would promptly and effectively support compliance with the obligations in the work contracts between employer and employee, the Mexican Government requested that the United States adopt legislation to authorize a United States Government agency to contract workers. Public Law 82-78 giving the legislative authority to employ agricultural workers from the Republic of Mexico was passed on July 12, 1951.

This legislation gave the Secretary of Labor the responsibility for bringing from Mexico agricultural workers subject to United States immigration laws. The Public Health Service, with responsibility for performing the physical and mental examinations of arriving aliens for the Immigration Service, continued to carry out the medical program for the Mexican laborers.

Following enactment of the new law, Mexico and the United States entered into the Migrant Labor Agreement of 1951. This agreement allowed establishment of migratory centers in

Mexico and reception centers in the United States to recruit and contract Mexican laborers. Both Public Law 78 and the Migrant Labor Agreement have been extended periodically. The present legislative authority will expire on June 30, 1959.

Medical Examination

It was agreed that the Public Health Service would conduct at the migratory centers in Mexico a physical and mental examination of each laborer to assure that he met the mental and health requirements for admission to the United States. If facilities were available, each laborer would be physically examined and given a photofluorographic chest X-ray, with modern equipment, and a serologic test. Service physicians were to be assisted by Mexican physicians who would later replace them. In accordance with the agreement, the migratory centers in Mexico were to be located at Aguascalientes, Aguascalientes; Guadalajara, Jalisco; Irapuato, Guanajuato; Monterrey, Nuevo Leon; and Chihuahua, Chihuahua.

On September 13, 1951, Public Health Service personnel and equipment for the photofluorographic activities at the migratory centers in Irapuato, Guadalajara, and Aguascalientes were dispatched to Mexico. However, inadequate electric power for operating fluorographic equipment made X-raying impossible. At Aguascalientes and Guadalajara it was reported that electric power could not be brought to buildings housing the X-ray equipment. In addition, power stations were reportedly shut down during daylight hours, and Service personnel were advised that there were troublesome voltage variations in the local municipal systems. During the period from September 13 to October 17, 1951, no X-rays were made. Because of these difficulties, it was concluded that the program had to be performed at the reception centers in the United States.

By October 31, 1951, approximately 120,000 laborers had been admitted to the United States without receiving chest X-rays. As a solution, the photofluorographic equipment was moved from the migratory centers in Mexico to reception centers in the United States. At Eagle Pass, Tex., the first X-rays were taken on No-

enter the United States as temporary visitors for work on farms during limited periods.

During World War II

At the beginning of World War II, demands for personnel in the war industries and the armed services created labor shortages, particularly in agriculture. The Mexican Government was requested to provide Mexican laborers for agricultural work in the United States, and in July 1942 that government consented to grant labor assistance as a part of its contribution to the war effort.

During and following World War II, the responsibility for the Mexican labor recruitment program was assigned to several United States agencies, such as the Farm Security Administration, the War Manpower Commission (with the U. S. Employment Service and U. S. Selective Service), and various branches of the U. S. Department of Agriculture (16). Within the administrative framework of the Farm Security Administration, and subsequently the War Food Administration, provision was made for carrying out a medical program for the agricultural workers. Accordingly, funds for the medical examination program were transferred from the responsible agency to the Division of Foreign Quarantine, Public Health Service.

Teams of Public Health Service medical officers from the Foreign Quarantine, Venereal Disease Control, and Tuberculosis Divisions were sent to Mexico to carry out examinations in cooperation with Mexican health officials.

According to a Public Health Service report on the history of the physical examinations, these officers followed traditional medical procedures used for immigrants. The workers were examined for conditions of the skin, heart, lungs, and teeth and for venereal diseases. Tests were also made of the eyes, ears, nose, and throat, the blood pressure, and the general skeletal, muscular, and nervous systems. Most laborers were vaccinated or revaccinated for smallpox and given initial typhoid inoculations. In addition, photofluorographic chest X-rays and serologic tests were given to prospective laborers when facilities permitted.

When the war emergency program began, the selection of eligible laborers was carried out in Mexico City, a practice which made possible a

centralized examination program. However, at the end of 1944 the selection center moved from Mexico City to Irapuato, and subsequently, other selection centers were established and operated at the discretion of the Mexican Government (16). Medical personnel with mobile X-ray units were sent from the Public Health Service to the recruiting points within Mexico, where numerous problems arose in operating the units (2). After 1 or 2 years of experience, Public Health Service medical officers were sent to the recruiting points in Mexico solely to assist local physicians in X-ray and other medical procedures connected with the examinations.

After World War II

Following World War II, recruiting continued under the provisions of international executive agreements between Mexico and the United States. Unfortunately, these agreements frequently were delayed until the need for such laborers in the United States was acute, and without an agreement, Mexican citizens could not be legally recruited. At the same time it was known that there were Mexican citizens entering the United States illegally for agricultural work.

According to a U. S. Department of Labor report, the number of Mexicans who entered this country illegally (wetbacks) increased from 29,000 in 1944 to 565,000 in 1950 (3). Both countries were concerned about the problem, but the Mexican border, approximately 1,600 miles in length, proved to be difficult to patrol effectively. There were then nine official crossing points along the Mexican border which were staffed by Public Health Service personnel. Although the Immigration Service was guarding the border, the number of patrol officers was not sufficient to force all to enter at the legal crossing points.

It was realized from the start that to give a medical examination, including chest X-ray, to each laborer who entered the United States was impossible. This was especially true during accelerated recruiting activities immediately after the signing of an international executive agreement. In addition, the large segment of the Mexican migrant labor force entering the

United States illegally obviously could not have been examined.

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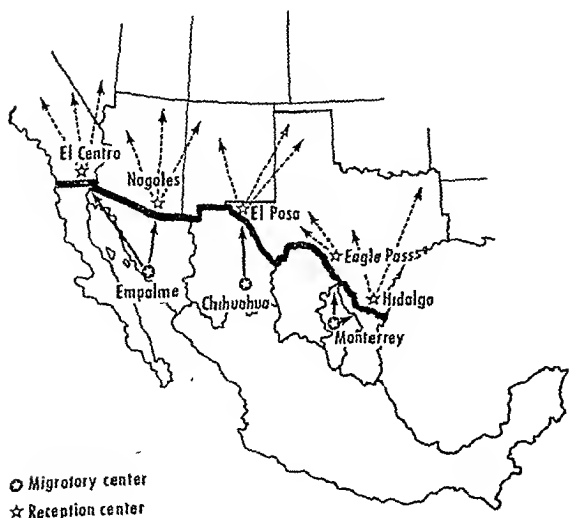
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venber 4, 1951. Photofluorographic equipment was installed at the reception centers in El Paso and Harlingen, Tex., and El Centro, Calif., and was in operation about 30 days after the establishment of the X-ray program at the Eagle Pass reception center.

The reception centers were successful in taking only 8,028 X-rays during the rush season. The reason for this limited number was that the majority of laborers had received contracts when the difficulties were being encountered in Mexico and before it was possible to install photofluorographic equipment at the reception centers in the United States. Many of the laborers X-rayed had already been in the United States and were returning to the reception centers to be recontracted.

Migratory and Reception Centers

There are, then, two types of migratory labor processing centers: migratory centers in Mexico and reception centers within the United States along the Mexican border. The reception centers in the United States now are at Hidalgo, Eagle Pass, and El Paso, Tex.; Nogales, Ariz.; and El Centro, Calif. In Mexico the number and the location of the migratory centers are influenced by the demand for laborers. During fiscal year 1957, Mexico's migratory centers were at Empalme, Sonora; Monterrey, Nuevo Leon, and Chihuahua, Chihuahua. Each migratory center recruits the laborers in accordance with requests received from the reception centers.



Until 1954, illegal entrants from Mexico continued to pose a serious problem. While the recruiting program contracted about 200,000 laborers under the terms of the international agreement during 1953, it was estimated that approximately 1 million Mexicans crossed the border illegally to accept employment.

In 1954, the U. S. Department of Justice increased the number of border patrol officers and took other effective measures leading to the gradual decline in the illegal entry of Mexican laborers.

A concomitant change occurred in the number of laborers recruited to fill the gap produced by the decline in illegal immigration. Based on experience, the U. S. Department of Labor had planned to request 260,000 laborers from Mexico during fiscal year 1955; however, it was necessary to recruit 350,000 laborers during that year in order to meet the demand. The number of laborers contracted each year has continued to increase, as indicated by the 428,416 laborers during fiscal year 1956 and 450,162 laborers during fiscal year 1957. Today the wetback problem has been largely resolved, and braceros are provided by the controlled farm labor program.

Current Medical Program

The action taken to control illegal immigration has made possible the conduct of an effective medical program for Mexican laborers. Since 1954, every laborer contracted by the U. S. Department of Labor has been given a medical examination. In addition, the medical program is geared to meet the increases in the need for agricultural workers, without sacrificing the quality of the medical examinations.

The entire medical program for Mexican laborers at the migratory centers in Mexico and the reception centers in the United States is carried out under the direction of the Public Health Service medical officer assigned to the district quarantine station, El Paso, Tex. Mexican doctors and nurses are employed to perform the medical examinations at the migratory centers in Mexico, and Public Health Service doctors and a limited number of contract doctors conduct the medical program at the reception centers in the United States.

The medical examination at the migratory centers in Mexico is essentially a screening process. On the basis of clinical diagnosis, laborers who have tuberculosis, venereal diseases, or other conditions making them unfit for accepting employment in the United States are rejected. Those who pass the physical examination are vaccinated for smallpox. The vaccine is provided by the Mexican Government without cost to the United States farm placement program.

The primary purpose of the physical examinations at migratory centers in Mexico is to eliminate unnecessary hardships for the Mexican laborers. Those who are rejected at the migratory centers are spared the trip to the reception center and the disappointment of being rejected and returned to the migratory center. In addition, the Mexican physicians at the migratory centers aid the laborers in finding medical care, frequently at the office of the Mexican health service, for remediable conditions. The record of medical rejections at the migratory centers for the fiscal years 1952 through 1957 is shown in table 1.

Laborers who pass the physical examination at the migratory centers are transported, under the supervision of the U. S. Labor Department, by railroad or bus to the reception centers. There they are first processed by the Public Health Service personnel. Each laborer and his personal effects are dusted with an insecticide. The laborer is then examined for evidence of venereal disease, given a photofluorographic chest X-ray, and examined for any other physical conditions which would be contagious or make the laborer unfit for agricul-

tural work. All laborers with evidence of venereal disease are routinely treated, and most of them are then permitted to accept employment. However, when a venereal disease case cannot be cured with a single treatment, the laborer is rejected and returned to Mexico.

All laborers with tuberculosis, contagious diseases, or other disqualifying physical defects are rejected and returned to the migratory centers in Mexico. In accordance with the joint operating instructions between the United States and the Mexican Government, effective July 1, 1956, laborers rejected at the reception centers must be reported to the Mexican consul. The Public Health Service doctor at the reception center gives the worker and the Mexican consul a written diagnosis of the case so that the information may be transmitted to the appropriate Mexican authorities. The medical causes for rejection and the number of laborers rejected at the reception centers for the fiscal years 1952 through 1957 are shown in table 2.

Medical Program Cost

Employers of Mexican laborers reimburse the United States Government for all expenses of the Mexican farm labor program, except costs of U. S. Department of Labor personnel, through a revolving fund to which employers pay a fixed fee per worker hired. The remainder of the fund is made up of Department of Labor appropriations. Since 1954 the costs of medical examinations of Mexican laborers have been charged to that fund.

Medical expenses are incurred for (a) medical examinations and vaccinations performed

Table 1. Medical rejections at the migratory centers for fiscal years 1952 through 1957

| Fiscal year | Number of laborers examined | Medical causes for rejection | | | | Total rejected | Rate of rejection |
|-------------|-----------------------------|------------------------------|---------------------------------------|------------------|------------------|----------------|-------------------|
| | | Mental | Tuberculosis and pulmonary conditions | Venereal disease | Other conditions | | |
| 1952 | 187,569 | 5 | 29 | 373 | 3,206 | 3,613 | 1.92 |
| 1953 | 205,941 | 70 | 93 | 588 | 7,033 | 7,784 | 3.77 |
| 1954 | 180,871 | 1 | 27 | 391 | 5,432 | 5,851 | 3.23 |
| 1955 | 263,376 | 0 | 52 | 1,189 | 4,353 | 5,594 | 2.12 |
| 1956 | 415,210 | 2 | 87 | 3,190 | 6,778 | 10,057 | 2.42 |
| 1957 | 440,332 | 3 | 35 | 1,808 | 3,741 | 5,587 | 1.26 |

Table 2. Medical causes for rejecting Mexican migrant laborers and number rejected at the reception centers during fiscal years 1952 through 1957

| Fiscal year | Number of laborers examined | Medical causes for rejection | | | | Total rejected | Rate of rejection |
|-------------|-----------------------------|------------------------------|---------------------------------------|------------------|------------------|----------------|-------------------|
| | | Mental | Tuberculosis and pulmonary conditions | Venereal disease | Other conditions | | |
| 1952----- | 333, 071 | 12 | 676 | 75 | 116 | 879 | 0.26 |
| 1953----- | 292, 891 | 39 | 2, 536 | 523 | 764 | 3, 862 | 1.3 |
| 1954----- | 221, 119 | 23 | 2, 724 | 188 | 658 | 3, 593 | 1.6 |
| 1955----- | 340, 070 | 9 | 4, 357 | 271 | 1, 132 | 5, 769 | 1.7 |
| 1956----- | 435, 332 | 13 | 5, 277 | 16 | 451 | 5, 757 | 1.3 |
| 1957----- | 457, 360 | 14 | 5, 050 | 98 | 416 | 5, 578 | 1.2 |

at the migratory centers in Mexico, (b) hospital and medical care for laborers who are injured or become ill between migratory centers and the reception center or at the reception center, and (c) medical examinations performed at the reception centers in the United States.

The Foreign Quarantine Division conducts the entire medical program at a minimal cost to employers. During fiscal year 1957 Mexican laborers were examined at the migratory centers in Mexico at a cost of approximately 20 cents per laborer. The complete medical examinations, including chest X-rays, at the reception centers in the United States, for 457,360 laborers amounted to approximately 73 cents per laborer. The medical examinations at the migratory centers in Mexico, hospital and medical care provided by the Public Health Service, and medical examinations at the reception centers in the United States were performed, on the average, for 95 cents per laborer receiving a contract for employment in the United States.

Today the medical program for the examination of Mexican laborers conducted by the quarantine service is effective because many of the problems plaguing efforts to conduct a complete medical program during and after World War II have been resolved. Control of illegal labor immigration, development of new techniques and equipment, and research have all contributed to the success of the present medical program. However, the program is subjected to continuous review and analysis in order to improve further the techniques and

procedures and to resolve the challenging problems still encountered.

Venereal Disease Program

For many years the Public Health Service and certain State health departments have been concerned about the possible importation of venereal infections into the United States by immigrants. In the examination program for Mexican laborers, the venereal disease aspect has received considerable attention. Mexican laborers recruited since the early part of World War II have been medically examined, and, whenever laboratory facilities have been available, have been given serologic tests for the detection of syphilis.

Prior to 1951 all serologic tests were performed in Mexico. However, in 1951 the migratory labor agreement between Mexico and the United States permitted Public Health Service physicians to carry out such examinations and treatment of positive cases of syphilis.

Since the beginning of fiscal year 1955, the Venereal Disease Program in cooperation with the Division of Foreign Quarantine, the Department of Labor, and several State health departments has serologically screened more than 300,000 migrant agricultural workers from Mexico. The annual figures are as follows:

| Fiscal year | Number tested | Number reactors | Percent reactive |
|-------------------------|---------------|-----------------|------------------|
| 1955----- | 24, 750 | 2, 614 | 10.6 |
| 1956----- | 31, 712 | 2, 914 | 9.2 |
| 1957----- | 165, 355 | 12, 559 | 7.6 |
| 1958 ¹ ----- | 96, 376 | 8, 008 | 8.3 |

¹ 7 months.

Screening of the migrant group for syphilis has been hindered by the fact that the blood specimens had to be mailed to distant laboratories for testing and the braceros were dispersed to various working localities before the test results were known. The reactors had to be traced to their place of work and brought in for diagnosis before they could be treated for syphilis. This procedure involved costly fieldwork and complicated recordkeeping. The Venereal Disease Program has solved this problem by developing a rapid blood test that gives immediate on-the-spot results. The new test, known as the rapid plasma reagin (RPR) test, is now being demonstrated in the Mexican-migrant testing program at El Centro, Calif., and reactive cases are detected immediately, diagnosed, and treated. Thus the need for field investigation work and records has been entirely eliminated.

In addition to diagnostic and treatment services provided at the El Centro reception center, epidemiological reports are prepared on marital contacts of venereally infected braceros and referred to State health departments in Mexico for followup.

Recently the Public Health Service presented to representatives of the U. S. Department of Labor and to growers concerned with the farm labor program of Mexico a plan for conducting a serologic screening service at the reception centers. This plan was unanimously approved although the screening as proposed means some additional cost to the growers. The demonstration project in El Centro was taken over by the Division of Foreign Quarantine on July 1, 1958, and similar activities are expected to start by September 1 at the three other large reception centers on the border. The Venereal Disease Branch of the Communicable Disease Center, Public Health Service, is assisting the Division of Foreign Quarantine by supplying personnel to advise on program requirements, to help train laboratory workers in RPR testing, and to assist in initiating the program at the other centers.

Photofluorographic X-rays

To the extent that X-ray facilities have been available and Mexican laborers legally recruited, it has been possible to prevent Mexican

laborers with tuberculosis from entering the United States. As effective control measures were taken to prevent illegal migration from Mexico, the number of laborers who were X-rayed and rejected under a controlled recruitment program continued to increase. Only 61,654 Mexican laborers were X-rayed during 1952 as compared with the 457,360 Mexican laborers in 1957.

Efforts were directed to establishing a complete X-ray program following the decision to carry out the X-ray program at the reception centers in the United States rather than at the migratory centers in Mexico. Because the X-ray activities required more time than any other phase of the examination, developing the most efficient methods of operation was emphasized. Today peak workloads of approximately 4,000 laborers per day are processed by achieving maximum capacity from each machine. The records reveal that two X-ray machines have taken as many as 5,400 photofluorograms during one 24-hour period. The total process, taking photofluorograms, developing the film, and reading the X-rays, has been accomplished at the reception centers without time delays.

While the laborers are at the reception centers, the photofluorograms are read by physicians with special training in radiology. When the X-ray reveals that a laborer has tuberculosis, the laborer is returned to Mexico. During the fiscal years 1952 through 1957, approximately 20,000 Mexican laborers were returned for that reason.

The rate of rejection of laborers with tuberculosis appears to be declining. Of the total examined, 1.22 percent were returned during fiscal years 1954 and 1955, 1.14 percent during 1956, and 1.07 percent during 1957.

In the past, one cause of a slowdown in the X-ray work had been the need to make 14" x 17" X-ray plates whenever the 70 mm. photofluorogram suggested tuberculosis or any other disqualifying condition. A recently developed X-ray camera improves the quality of the film to the extent that 14" x 17" X-ray plates are no longer necessary. In addition to saving the cost of the 14" x 17" X-ray plates, the new camera decreases the radiation exposure to about one-third of that received from the pres-

ent equipment. Plans are being made to install this camera at all reception centers.

Louse Control

The human body louse is the well-known transmitter of typhus, one of the six quarantinable diseases. In the course of careful control activities against the insect, including disinfestation with DDT, the question of louse resistance to that insecticide arose.

Historically, DDT-resistant body lice were first observed in Korea in 1951. The insecticide, used so effectively throughout the world in the control of lice, and certain others used since 1945 were no longer effective in the control of body lice in that war area. It was found, however, that lindane brought satisfactory control. Also, an insecticide mixture containing pyrethrum, used for many years in insect control work, proved effective against DDT-resistant lice. Unfortunately, however, it was found that pyrethrum does not possess the highly desirable residual quality of DDT and lindane.

Further, findings in 1953 from a survey of the World Health Organization showed an alarming degree of insecticide resistance, particularly to DDT, in the lice studied in a number of countries. This survey found resistance to DDT in body lice in Mexico and reported a few instances of louse resistance to lindane and even to pyrethrum, findings corroborated in more recent studies.

During February and March 1957, the Public Health Service conducted at El Centro, Calif., tests which showed moderate resistance to DDT. When lice were exposed for 24 hours to 0.1 percent DDT in 4 tests, the survival rate ranged from 32 percent to 100 percent. The average survival in these 4 tests was 59.0 percent. When 0.5 percent DDT was used in 6 tests, the survival rate ranged from 9.0 percent to 37.0 percent, with an average of 20.0 percent. Application of 1.0 percent DDT in 6 tests showed a survival rate ranging from 8.0 percent to 35.0 percent, with an average of 20.0 percent. Use of 5.0 percent DDT in 4 tests provided survival rates ranging from 3.0 percent to 40.0 percent, with an average of 25.0 percent. In all tests at least moderate resistance to DDT was exhibited by the lice. These findings are supported by results of studies conducted since.

At least for the present, the use of DDT in louse control work along the Mexican border has been abandoned, and although lindane appears satisfactory now, possibly within the next year or two this insecticide may suffer the same fate. New insecticides must be ready for use at that time. Otherwise, it may become necessary to revert to the cumbersome and expensive louse-control methods used prior to DDT. In that era, clothing, bedding, and other items were treated with steam or dry heat in specially constructed autoclaves or with chemicals such as hydrocyanic acid gas or chloropicrin. Persons were treated with kerosene emulsion soap and other similar crude formulations.

Scientists and insecticide manufacturers throughout the world are striving to find insecticides that may be effectively and safely employed in louse control. The actual efficacy and, particularly, the safe use of new insecticides for the control of body lice on human beings remains to be demonstrated, first in the laboratory and then under operational conditions in the field. The Division of Foreign Quarantine is now planning a research program for studies which will lead to a solution of the insecticide resistance problem.

In spite of setbacks from insecticide resistance, the Foreign Quarantine Division's louse control activities have had some measure of success. It was the opinion of professional personnel making the medical examinations of Mexican laborers in 1951 and 1952 that as many as one-half of the Mexican laborers were suffering from pediculosis. A careful inspection of a number of Mexican laborers during 1956 showed infestation to be only about 10 percent.

Smallpox Vaccination

Mexican laborers are vaccinated against smallpox in compliance with the Public Health Service requirements. Until recently, Mexican laborers were vaccinated each year without regard to previous vaccinations even though the recognized period of immunity after a successful immunization is 3 years. The practice of revaccinating many of the laborers upon reentry was adopted as the most expeditious means of insuring that all laborers were immunized. During the past year the U. S. Department of Justice has adopted the practice

of issuing identification cards on which the date of the smallpox vaccination is stamped. After the Mexican laborers are issued identification cards, they will be revaccinated only at the end of a 3-year period. The revised procedure will provide the necessary immunization against smallpox and, at the same time, reduce the amount of vaccine and personal services needed previously to vaccinate all laborers annually.

Medical Care Program

The Division of Foreign Quarantine provides emergency medical care for Mexican workers who become ill while enroute from the migratory centers in Mexico or who otherwise need emergency medical care while at the reception centers in the United States. Nearby hospitals have been contracted to care for the laborers who develop serious or prolonged illnesses. The need for hospital care is determined by the medical personnel at the reception centers. Expenditures for hospitalization have been extremely low in comparison with the number of laborers who enter the reception centers each year. The cost of hospitalization was \$9,331 during fiscal year 1955, \$12,586 during 1956, and only \$5,649 during 1957.

The requirements for emergency medical care at the reception centers have always been unpredictable. In 1957, an unprecedented need for this care occurred when the Asian influenza became epidemic among the Mexican laborers. A total of 4,122 cases of influenza was reported by the reception centers from August 3 through October 11, 1957. Because of the short duration and mildness of the illness, the patients usually did not require hospitalization, and it was necessary to provide medical care at the reception centers. During the height of the epidemic the medical personnel frequently worked round-the-clock. Only two laborers were sent to contract hospitals for treatment.

After the Mexican laborer has been contracted and leaves the reception center, the employer is responsible for providing medical care. The laborer, while employed in the United States, is given the same guarantees with respect to medical care and compensation that are provided to domestic agricultural

workers under applicable State laws. In the absence of such laws, the employer must either obtain an insurance policy or supply an indemnity bond to secure the payment of benefits, including medical, surgical, and other necessary care and treatment, for work-connected illness or injury. In addition to insuring the laborer against occupational risks, the employer must also obtain life and nonoccupational insurance for the Mexican workers. However, the premiums for the latter insurance are deducted from the Mexican worker's wages.

Summary

The recruitment of Mexican laborers, originally a war emergency measure at the beginning of World War II, has become an established program. Mexican laborers are considered essential in the production of agricultural products in the United States, and during 1957 they were employed in 27 States. At present, Mexican laborers represent approximately two-fifths of all the migrant laborers (United States and foreign) employed in the United States.

Since the start of recruitment in 1942, a specific program for the medical examination of these laborers has been carried out by the Public Health Service. However, for many years the Mexican labor program was fraught with unique problems precluding the most effective conduct of its medical phase. The progress of such a program depended upon the establishment of effective international agreements between the United States Government and the Mexican Government. The United States Government, moreover, had to enact special legislation on the employment of Mexican nationals and had to take effective measures to prevent the illegal immigration of laborers into the United States.

Since 1954 every Mexican laborer who has received a contract for employment in the United States has been dusted with an insecticide, vaccinated, examined for evidence of venereal disease, given a photofluorographic chest X-ray, and examined for any other condition which would make the laborer inadmissible or unfit for agricultural work.

Of the challenging problems in the medical

examination program, louse control is one of the most significant. Scientists throughout the world are searching for new insecticides that may be effectively and safely employed in louse control, and the quarantine service is planning to participate in the laboratory research. The Public Health Service continues to seek new methods to improve the present program in order to prevent the introduction of dangerous contagious diseases into the United States.

REFERENCES

- (1) Jones, R. C.: Mexican war workers in the United States. Washington, D. C., Pan American Union, 1945, (a) p. 7; (b) pp. 3-4; (c) p. 6.
- (2) Gregg, R.: Medical examination and vaccination of farm laborers recruited from Mexico. Pub. Health Rep. 65: 807-809, June 23, 1950.
- (3) U. S. President's Commission on Migratory Labor: Recommendation. Washington, D. C., U. S. Bureau of Labor Statistics, 1952. Mimeographed.

Rehabilitation of the Deaf-Blind

Publication of a manual to guide the rehabilitation of the deaf-blind was announced at a meeting June 19, 1958, in Washington, D. C., sponsored by the Industrial Home for the Blind in Brooklyn, N. Y., and the Office of Vocational Rehabilitation, Department of Health, Education, and Welfare. This book for professional workers is the first such major effort in the United States for the rehabilitation of the deaf-blind.

The manual is the result of 2 years of study and research by the staff of the home and other specialists, supported by a research grant from the Federal agency. It is primarily a summary report of the pilot study, treating rehabilitation of the deaf-blind in simple language. Later volumes will discuss more technical aspects.

At the Washington meeting, Miss Mary E. Switzer, director of the Office of Vocational Rehabilitation, received the first copy of the manual from Peter J. Salmon, executive director of the home. Miss Switzer, pointing out that the key to rehabilitation of the deaf-blind is communication, said that one of the easiest methods is the recently developed international standard manual alphabet, now recommended for worldwide use. In this system, the communicator uses an index finger to outline standard block letters in the palm of the recipient.

A member of the home's staff, Robert J. Smithdas, who holds a master's degree although he has been blind and deaf since child-



Peter J. Salmon uses a grease pencil to demonstrate the new international standard manual alphabet. Robert J. Smithdas is the "reader." In actual practice, letters are merely traced in the palm of the hand.

hood, demonstrated the system at the meeting. Others attending the gathering were representatives of Gallaudet College and other organizations concerned with the blind and the deaf.

Copies of *Rehabilitation of Deaf-Blind Persons: A Manual for Professional Workers* are available from the Industrial Home for the Blind, 127 Willoughby St., Brooklyn, N. Y.

Milk Sanitation Honor Roll for 1956-58

Eighty-five communities have been added to the Public Health Service milk sanitation "honor roll," and 51 communities on the previous list have been dropped. This revision covers the period from July 1, 1956, to June 30, 1958, and includes a total of 283 cities and 87 counties.

Communities on the honor roll have complied substantially with the various items of sanitation contained in the milk ordinance suggested by the U. S. Public Health Service. The State milk sanitation authorities concerned report this compliance to the Public Health Service. The rating of 90 percent or more, which is necessary for inclusion on the list, is computed from the weighted average of the percentages of compliance. Separate lists are compiled for communities in which all market milk sold is pasteurized, and for those in which both raw milk and pasteurized milk are sold.

The suggested milk ordinance, on which the milk sanitation ratings are based, is in effect through voluntary adoption in 480 counties and 1,400 municipalities. The ordinance also serves as the basis for the regulations of 34 States and 2 Territories. In 14 States and 2 Territories it is in effect statewide.

The ratings do not represent a complete measure of safety, but they do indicate how closely a community's milk supply conforms to the standards for grade A milk as stated in the suggested ordinance. High-grade pasteurized milk is safer than high-grade raw milk because of the added protection of pasteurization. The second list, therefore, shows the percentage of pasteurized milk sold in a community which also permits the sale of raw milk.

Although semiannual publication of the list is intended to encourage communities operating under the

This compilation is from the Division of Sanitary Engineering Services, Bureau of State Services, Public Health Service. The previous listing was published in Public Health Reports, March 1958, pp. 279-282. The rating method was described in Public Health Reports 53: 1386 (1938). Reprint No. 1970.

suggested ordinance to attain and maintain a high level of enforcement of its provisions, no comparison is intended with communities operating under other milk ordinances. Some communities might be deserving of inclusion, but they cannot be listed because no arrangements have been made for determination of their ratings by the State milk sanitation authority concerned. In other cases, the ratings which were submitted have lapsed because they are more than 2 years old. Still other communities, some of which may have high-grade milk supplies, have indicated no desire for rating or inclusion on this list.

The rules for inclusion of a community on the honor roll are:

1. All ratings must be determined by the State milk sanitation authority in accordance with the Public Health Service rating method, which is based upon the grade A pasteurized milk and the grade A raw milk requirements of the Public Health Service milk ordinance. (A departure from the method described consists of computing the pasteurized milk rating by weighting the pasteurization plant rating twice that of the raw milk intended for pasteurization.)

2. No community will be included

on the list unless both its pasteurized milk and its retail raw milk ratings are 90 percent or more. Communities in which only raw milk is sold will be included if the retail raw milk rating is 90 percent or more.

3. The rating used will be the latest submitted to the Public Health Service, but no rating will be used which is more than 2 years old. (In order to promote continuous rigid enforcement rather than occasional "cleanup campaigns," it is suggested that, when the rating of a community on the list falls below 90 percent, no resurvey be made for at least 6 months. This will result in the removal of the community from the subsequent semiannual list.)

4. No community will be included on the list unless its milk supply is under an established program of official routine inspection and laboratory control provided by itself, the county, a milk control district, or the State. (In the absence of such an official program, there can be no assurance that only milk from sources rating 90 percent or more will be used continuously.)

5. The Public Health Service will make occasional check surveys of cities for which ratings of 90 percent or more have been reported by the State. (If the check rating is less than 90 percent, but not less than 85, the city will be removed from the 90-percent list after 6 months unless a resurvey submitted by the State during this probationary period shows a rating of 90 percent or more. If the check rating is less than 85 percent, the city will be removed from the list immediately. If the check rating is 90 percent or more, the city will be retained on the list for 2 years from the date of the check survey unless a subsequent rating during this period warrants its removal.)

Communities awarded milk sanitation ratings of 90 percent or more, July 1956-June 1958

100 PERCENT OF MARKET MILK PASTEURIZED

| <i>Community</i> | <i>Date of rating</i> | <i>Community</i> | <i>Date of rating</i> | <i>Community</i> | <i>Date of rating</i> |
|-----------------------------|-----------------------|---------------------------|-----------------------|--------------------------|-----------------------|
| <i>Arizona</i> | | <i>Illinois—Continued</i> | | <i>Kentucky</i> | |
| Graham County..... | 10-16-1956 | Highland Park | | Barbourville..... | 11-28-1956 |
| Phoenix..... | 2--1957 | Kenilworth | | Bardstown and Nelson | |
| <i>Colorado</i> | | Lake Bluff | | County..... | 5-21-1957 |
| Boulder County..... | 12-14-1956 | Lake Forest | | Bell County..... | 4-19-1957 |
| Colorado Springs..... | 12-13-1957 | Northbrook | | Benton and Marshall | |
| Denver..... | 8-27-1957 | Wilmette | | County..... | 2-6-1958 |
| Las Animas-Huerfano | | Winnetka | | Bowling Green and War- | |
| Counties..... | 4-22-1958 | Oak Park..... | 3-6-1957 | ren County..... | 7-22-1957 |
| Pueblo County..... | 2-13-1958 | Peoria..... | 4-17-1958 | Brandenburg..... | 4-11-1957 |
| Weld County..... | 10-24-1957 | <i>Indiana</i> | | Butler and Falmouth.. | 4-2-1958 |
| <i>District of Columbia</i> | | Anderson..... | 5-22-1957 | Cadiz..... | 10-5-1956 |
| Washington..... | 3-6-1958 | Berne, Bluffton, Warren | | Campbellsville..... | 4-5-1957 |
| <i>Georgia</i> | | area..... | 1-17-1957 | Covington..... | 6-13-1957 |
| Albany..... | 11-22-1957 | Bloomington..... | 1-10-1958 | Cynthiana and Harrison | |
| Athens-Clarke County.. | 4-2-1957 | Bremen..... | 1-29-1958 | County..... | 4-8-1958 |
| Atlanta..... | 8-23-1957 | Calumet region..... | 4-24-1957 | Danville and Boyle | |
| Augusta..... | 2-11-1958 | East Chicago | | County..... | 4--1958 |
| Bainbridge..... | 3-25-1958 | Gary | | Elizabethtown..... | 1-8-1958 |
| Baxley..... | 8-14-1956 | Hammond | | Frankfort..... | 10-18-1957 |
| Cairo..... | 5-7-1958 | Columbia City..... | 6-26-1957 | Georgetown..... | 10-16-1956 |
| Calhoun-Gordon | | Cooperative Grade A | | Greenville..... | 1-21-1958 |
| County..... | 9-7-1956 | area..... | 2-13-1958 | Harrodsburg..... | 2-20-1957 |
| Cartersville..... | 1-30-1957 | Holland | | Hodgenville..... | 2-14-1957 |
| Columbus..... | 1-18-1957 | Huntingburg | | Hopkinsville and Chris- | |
| Dalton-Whitfield | | Jasper | | tian County..... | 9-26-1957 |
| County..... | 5-21-1957 | Tell City | | Lawrenceburg and An- | |
| Griffin..... | 11-14-1957 | Elkhart, Goshen, Nap- | | derson County..... | 6-5-1958 |
| La Grange..... | 12-20-1956 | panee area..... | 12-5-1957 | Leitchfield and Grayson | |
| Moultrie..... | 5-22-1957 | Evansville..... | 12-20-1956 | County..... | 10-10-1957 |
| Quitman..... | 5-8-1957 | Frankfort..... | 6-10-1957 | Liberty..... | 10-11-1956 |
| Savannah-Chatham | | Indiana Falls City area. | 10-16-1957 | Louisville and Jefferson | |
| County..... | 9-25-1956 | Jeffersonville | | County..... | 3--1958 |
| Statesboro-Bulloch | | New Albany | | Mayfield and Graves | |
| County..... | 3-27-1957 | Salem | | County..... | 8-2-1957 |
| Valdosta..... | 3-12-1958 | Scottsburg | | Maysville..... | 7-23-1957 |
| Waycross..... | 3-14-1958 | Kokomo..... | 2-19-1957 | Monticello..... | 7-20-1956 |
| <i>Illinois</i> | | Lafayette and W. La- | | Morganfield and Union | |
| Chicago..... | 6-13-1957 | fayette..... | 5-5-1958 | County..... | 1-21-1958 |
| East Side Health Dis- | | Lake County..... | 3-25-1957 | Morgantown..... | 1-10-1958 |
| trict..... | 6-5-1958 | Logansport..... | 3-27-1958 | Murray and Calloway | |
| Brooklyn | | Marion County..... | 4-2-1958 | County..... | 2-5-1958 |
| Cahokia | | Michigan City..... | 4-23-1958 | Newport and Campbell | |
| East St. Louis | | Muncie..... | 11-30-1956 | County..... | 10-18-1957 |
| Fairmont City | | New Castle..... | 4-24-1958 | Owensboro..... | 5-9-1958 |
| National City | | North Manchester..... | 7-3-1957 | Owenton..... | 3-31-1958 |
| Washington City | | Peru..... | 4-10-1957 | Paducah..... | 7-31-1957 |
| Evanston..... | 3-13-1957 | Richmond..... | 1-24-1957 | Paris and Bourbon | |
| North Shore municipal- | | Rochester..... | 12-19-1956 | County..... | 1-1958 |
| ities..... | 3-20-1957 | South Bend..... | 12-11-1957 | Pendleton County.. | 1-2-1958 |
| Glencoe | | Union City..... | 7-3-1957 | Shelby County..... | 1-17-1958 |
| | | Vincennes..... | 10-3-1957 | Smithland and Living- | |
| | | Warsaw..... | 11-16-1956 | ston County..... | 2-7-1958 |
| | | Winchester..... | 5-7-1957 | Trigg County..... | 10-5-1956 |

100 PERCENT OF MARKET MILK PASTEURIZED—Continued

1958

Communities awarded milk sanitation ratings of 90 percent or more, July 1956-June 1958—Con.

100 PERCENT OF MARKET MILK PASTEURIZED—Continued

| Community | Date of rating | Community | Date of rating | Community | Date of rating |
|---------------------|----------------|---------------------------|----------------|----------------------------|----------------|
| <i>Utah</i> | | <i>Virginia—Continued</i> | | <i>Wisconsin—Continued</i> | |
| Logan..... | 5-22-1958 | Staunton..... | 4- 4-1958 | Elkhorn..... | 10-24-1956 |
| Ogden..... | 10-30-1957 | Suffolk..... | 6- 6-1957 | Fontana..... | 10-24-1956 |
| Salt Lake City..... | 5- 6-1958 | Waynesboro..... | 12- 5-1957 | Fort Atkinson..... | 10-24-1956 |
| Utah County..... | 11-29-1957 | | | Green Bay..... | 10-11-1957 |
| <i>Virginia</i> | | <i>Washington</i> | | Kenosha..... | 7- 5-1957 |
| Abingdon..... | 11- 7-1957 | Spokane..... | 10-24-1956 | La Crosse..... | 1-29-1957 |
| Alexandria..... | 6-28-1957 | Whitman County..... | 11- 8-1956 | Lake Geneva..... | 10-24-1956 |
| Blacksburg..... | 8-16-1956 | | | Madison..... | 11-29-1957 |
| Bristol..... | 11- 7-1957 | <i>Wisconsin</i> | | Manitowoc..... | 4-12-1957 |
| Christiansburg..... | 8-16-1956 | Appleton..... | 1-10-1957 | Oshkosh..... | 7-11-1956 |
| Franklin..... | 6- 7-1957 | Ashland..... | 10-10-1957 | Racine..... | 7-12-1956 |
| Marion..... | 11-29-1956 | Beaver Dam..... | 2- 6-1957 | Ripon..... | 2- 6-1957 |
| Portsmouth..... | 3- 7-1957 | Beloit..... | 1-23-1958 | Sheboygan..... | 7-26-1957 |
| Pulaski..... | 8-17-1956 | Burlington..... | 10-24-1956 | Walworth..... | 10-24-1956 |
| Radford..... | 8-15-1956 | Delavan..... | 10-24-1956 | Waupun..... | 2- 6-1957 |
| Richmond..... | 4-18-1958 | Eau Claire..... | 2- 7-1957 | Williams Bay..... | 10-24-1956 |

BOTH RAW AND PASTEURIZED MARKET MILK

| Community and percent of milk pasteurized | Date of rating | Community and percent of milk pasteurized | Date of rating | Community and percent of milk pasteurized | Date of rating |
|---|----------------|---|----------------|---|----------------|
| <i>Georgia</i> | | <i>North Carolina</i> | | <i>Texas—Continued</i> | |
| Cedartown, 96.9..... | 8-31-1957 | Buncombe County, 98.7.. | 4- 1-1958 | Fort Worth, 99.98..... | 6-14-1957 |
| Fitzgerald, 97.9..... | 4-11-1957 | Cleveland County, 89.9.. | 9-10-1956 | Longview, 99..... | 2-20-1957 |
| Marietta, 97.8..... | 10-26-1956 | Gaston County, 97.9.... | 7-19-1957 | Marshall, 98..... | 1- 4-1957 |
| Rome, 99.1..... | 10-16-1957 | Wake County, 99.9..... | 1-27-1958 | Palestine, 99.2..... | 10- 2-1957 |
| Washington, 99.8..... | 3- 1-1957 | | | Paris, 99..... | 12- 5-1957 |
| Winder, 99..... | 3- 7-1957 | <i>Oklahoma</i> | | <i>Virginia</i> | |
| <i>Idaho</i> | | McAlester, 84..... | 7-18-1956 | <i>Washington</i> | |
| Ada County, 96..... | 1-11-1957 | Oklahoma City, 98..... | 11- 9-1956 | Charlottesville, 99.6.... | 9-27-1957 |
| <i>Kentucky</i> | | <i>Tennessee</i> | | <i>West Virginia</i> | |
| Lexington and Fayette County, 99..... | 9-13-1956 | Harriman, 95..... | 4- 2-1958 | Seattle-King County, 99.7..... | 4- 9-1957 |
| Madisonville, 99..... | 1-25-1957 | Kingston, 96.5..... | 1- 2-1958 | | |
| Princeton, 96.5..... | 2-21-1957 | <i>Texas</i> | | <i>Wisconsin</i> | |
| Somerset, 95..... | 1-10-1957 | Abilene, 90..... | 10-10-1957 | Kanawha County, 99..... | 11-20-1956 |
| <i>Missouri</i> | | Amarillo, 99.7..... | 8-13-1957 | Monongalia County, 97.8..... | 8- 9-1957 |
| Joplin, 91.1..... | 2- 5-1958 | Austin, 99.4..... | 1-28-1957 | | |
| | | Brownsville, 98.3..... | 2-12-1958 | | |

NOTE: In these communities the pasteurized market milk shows a 90-percent or more compliance with the grade A pasteurized milk requirements, and the raw market milk shows a 90-percent or more

compliance with the grade A raw milk requirements, of the milk ordinance suggested by the United States Public Health Service.

Notice particularly the percentage pasteurized in the various communi-

ties listed. This percentage is an important factor to consider in estimating the safety of a city's milk supply. All milk should be pasteurized, either commercially or at home, before it is consumed.

publications

Trachoma Manual and Atlas. *PHS Publication No. 541; 1958; by Philip Thygeson; 42 pages; illustrated; 55 cents.*

The stages of trachoma, its clinical and laboratory diagnosis, and the criteria for differentiating trachoma from other follicular disease and either acute or chronic bacterial conjunctivitis are explained comprehensively in this medical handbook. Also discussed are the treatment procedures recommended for trachoma control campaigns. A series of photographs, 51 in black and white and 12 in color, show the gross appearance of trachoma and similar diseases in their various developmental stages.

Designed primarily for use by physicians and nurses in the Indian health program of the Public Health Service, the manual has potential value in trachomatous areas of other nations.

Dermatophytes—New methods in classification. *PHS Publication (unnumbered); 1957; 15 pages.*

It is recommended that physiological tests be used in conjunction with morphological studies for the accurate identification and classification of dermatophyte species.

A series of tests based on the nutritional requirements of certain dermatophyte species for vitamins and amino acids is described. These tests are particularly useful for identifying nonsporulating species such as *Trichophyton verrucosum*, *T. schoenleinii*, and *T. concentricum*. They are also useful for identifying morphologically similar species such as *T. mentagrophytes* and *T. tonsurans* or morphologically atypical strains of any of the *Trichophyton* species.

Another physiological test described is based on the manner by which detached filaments of hair are attacked by dermatophyte species. This is particularly useful in

the separation of *T. mentagrophytes* and *T. rubrum* which attack hairs in vitro in different ways.

Free copies may be obtained from the Communicable Disease Center, Public Health Service, Atlanta 23, Ga.

The Research Attack Against Cerebral Palsy. *PHS Publication No. 552; 1958; 20 pages; 20 cents.*

The nature of cerebral palsy and the collaborative field investigation on this disorder being conducted through the National Institute of Neurological Diseases and Blindness are described in simple terms.

The booklet reviews some of the research findings of the recent past which may play an important role in the development of better methods of diagnosis, prevention, and treatment of cerebral palsy. It also contains an outline of the institute's grant programs as well as a concise view of the organization and growth of the institute as a component in the research mission of the National Institutes of Health.

The Dental Service Corporation—A new approach to dental care. *PHS Publication No. 570; 1958; 70 pages.*

Major points to consider in the formation, establishment, and operation of a nonprofit dental service corporation are reviewed.

One section of the pamphlet reports the historical development of the Washington State Dental Service Corporation, describes the corporate structure, and reviews its administration of a dental service program for the International Longshoremen's and Warehousemen's Union—Union Pacific Maritime Association Welfare Fund.

Another section covers general questions that planners of a dental service corporation must answer. Included are legal problems, tax re-

quirements, contract negotiations, administrative principles, premium determinations, and statistical system planning.

Summary of Health and Vital Statistics. *PHS Publication No. 600; 1958; 27 pages; 25 cents.*

Frequently requested recent and background statistical data pertaining to the United States are depicted in 24 tables and 12 charts with explanatory paragraphs. They cover the total population and the population by age as well as school enrollments, marriages and divorces, live births and fetal deaths, and illegitimate live births.

Infant and maternal mortality, total deaths and deaths by age, leading causes of death and leading causes of death by age groups, deaths from cancer and other malignant neoplasms, and deaths from accidents (including cause of injury) are tabulated by year, number, and rate.

The booklet also presents statistics on reported cases of and registered deaths caused by communicable diseases, cases of general illness from selected causes, and average remaining lifetime at specified ages for the entire population as well as by color and sex. A study of the beds available in civilian hospitals and skilled nursing homes is included.

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared by other Federal agencies.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications other than its own.

Communities awarded milk sanitation ratings of 90 percent or more, July 1956-June 1958—Con.

100 PERCENT OF MARKET MILK PASTEURIZED—Continued

| <i>Community</i> | <i>Date of rating</i> | <i>Community</i> | <i>Date of rating</i> | <i>Community</i> | <i>Date of rating</i> |
|---------------------|-----------------------|---------------------------|-----------------------|----------------------------|-----------------------|
| <i>Utah</i> | | <i>Virginia—Continued</i> | | <i>Wisconsin—Continued</i> | |
| Logan..... | 5-22-1958 | Staunton..... | 4- 4-1958 | Elkhorn..... | 10-24-1956 |
| Ogden..... | 10-30-1957 | Suffolk..... | 6- 6-1957 | Fontana..... | 10-24-1956 |
| Salt Lake City..... | 5- 6-1958 | Waynesboro..... | 12- 5-1957 | Fort Atkinson..... | 10-24-1956 |
| Utah County..... | 11-29-1957 | | | Green Bay..... | 10-11-1957 |
| <i>Virginia</i> | | <i>Washington</i> | | Kenosha..... | 7- 5-1957 |
| Abingdon..... | 11- 7-1957 | Spokane..... | 10-24-1956 | La Crosse..... | 1-29-1957 |
| Alexandria..... | 6-28-1957 | Whitman County..... | 11- 8-1956 | Lake Geneva..... | 10-24-1956 |
| Blacksburg..... | 8-16-1956 | | | Madison..... | 11-29-1957 |
| Bristol..... | 11- 7-1957 | <i>Wisconsin</i> | | Manitowoc..... | 4-12-1957 |
| Christiansburg..... | 8-16-1956 | Appleton..... | 1-10-1957 | Oshkosh..... | 7-11-1956 |
| Franklin..... | 6- 7-1957 | Ashland..... | 10-10-1957 | Racine..... | 7-12-1956 |
| Marion..... | 11-29-1956 | Beaver Dam..... | 2- 6-1957 | Ripon..... | 2- 6-1957 |
| Portsmouth..... | 3- 7-1957 | Beloit..... | 1-23-1958 | Sheboygan..... | 7-26-1957 |
| Pulaski..... | 8-17-1956 | Burlington..... | 10-24-1956 | Walworth..... | 10-24-1956 |
| Radford..... | 8-15-1956 | Delavan..... | 10-24-1956 | Waupun..... | 2- 6-1957 |
| Richmond..... | 4-18-1958 | Eau Claire..... | 2- 7-1957 | Williams Bay..... | 10-24-1956 |

BOTH RAW AND PASTEURIZED MARKET MILK

| <i>Community and percent of milk pasteurized</i> | <i>Date of rating</i> | <i>Community and percent of milk pasteurized</i> | <i>Date of rating</i> | <i>Community and percent of milk pasteurized</i> | <i>Date of rating</i> |
|--|-----------------------|--|-----------------------|--|-----------------------|
| <i>Georgia</i> | | <i>North Carolina</i> | | <i>Texas—Continued</i> | |
| Cedartown, 96.9..... | 8-31-1957 | Buncombe County, 98.7.. | 4- 1-1958 | Fort Worth, 99.98..... | 6-14-1957 |
| Fitzgerald, 97.9..... | 4-11-1957 | Cleveland County, 89.9.. | 9-10-1956 | Longview, 99..... | 2-20-1957 |
| Marietta, 97.8 .. | 10-26-1956 | Gaston County, 97.9 .. | 7-19-1957 | Marshall, 98..... | 1- 4-1957 |
| Rome, 99.1..... | 10-16-1957 | Wake County, 99.9..... | 1-27-1958 | Palestine, 99.2 | 10- 2-1957 |
| Washington, 99.8..... | 3- 1-1957 | | | Paris, 99 | 12- 5-1957 |
| Winder, 99..... | 3- 7-1957 | <i>Oklahoma</i> | | <i>Virginia</i> | |
| <i>Idaho</i> | | McAlester, 84..... | 7-18-1956 | <i>Washington</i> | |
| Ada County, 96 .. | 1-11-1957 | Oklahoma City, 98..... | 11- 9-1956 | Charlottesville, 99.6.... | 9-27-1957 |
| <i>Kentucky</i> | | <i>Tennessee</i> | | <i>West Virginia</i> | |
| Lexington and Fayette County, 99..... | 9-13-1956 | Harriman, 95. | 4- 2-1958 | Seattle-King County, 99.7 .. | 1- 9-1957 |
| Madisonville, 99 .. | 1-25-1957 | Kingston, 96.5 | 1- 2-1958 | | |
| Princeton, 96.5 .. | 2-21-1957 | <i>Texas</i> | | | |
| Somerset, 95 | 1 10-1957 | Abilene, 90..... | 10-10-1957 | | |
| <i>Missouri</i> | | Amarillo, 99.7 | 8-13-1957 | | |
| Joplin, 91.1..... | 2- 5-1958 | Austin, 99.4..... | 1-28-1957 | Kanawha County, 99 | 11-20-1956 |
| | | Brownsville, 98.3..... | 2-12-1958 | Monongalia County, 97.8 | 8- 9-1957 |

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A Controlled Evaluation of Mass Surveys for Tuberculosis and Heart Disease

PHILIP E. ENTERLINE, M.A., and BERNARD KORDAN, M.D.

A BASIC ASSUMPTION underlying mass casefinding programs is that those persons with disease who are detected are "better off" than they would have been had they not been detected. This assumption has never been completely tested, primarily because of the difficulty of obtaining a control group. A control group would consist of randomly selected persons participating in the casefinding program whose screening tests are positive but who are not advised of these results and are allowed to go on their way to be discovered by some other procedure, or possibly are never detected. Since casefinding programs are considered a service, a control group usually cannot be withheld deliberately, for moral and ethical reasons.

It recently became apparent that controls might be obtained for the evaluation of chest X-ray programs without raising questions of propriety or medical ethics. It has been known for some time that there are inconsistencies in interpreting chest photofluorograms (1-3); when two readers interpret a series of X-ray films, no matter how similar their training and orientation, some of the films will be selected as positive by one and negative by the other. This same phenomenon has been reported for

interpretations of electrocardiograms (4) and for examinations of children for tonsillectomy (5), and no doubt it could be observed in the application of many medical procedures.

In casefinding programs based on a single reading of photofluorograms, it is possible to identify by reading the films at a later date persons who appear positive but who were considered negative on the first reading. This group, who would not have received any benefits from the casefinding program since their apparent abnormality was not detected, would seem to constitute a control group for testing the assumption that persons whose disease is detected are better off than they would have been otherwise. The procedure would also identify a comparable group of persons considered positive on the initial reading and negative on the second reading. This group would have received whatever benefits casefinding has to offer and would constitute the study group.

Using this procedure for selecting study and control groups, we have examined the mortality experience of X-ray survey participants during a period of approximately 3½ years as an index of the benefits of this type of casefinding program. More than 200,000 photofluorograms taken in two large-scale, communitywide surveys, one in Los Angeles City and County, Calif., and the other in Dallas City and County, Tex., were re-read 3 to 5 years after the completion of the surveys. Sponsoring or participating in this study were the Texas and California State Health Departments, the Dallas and Los Angeles City Health Departments, the Dallas City and County and the Los Angeles

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ECHOES from Public Health Reports

TYPHUS FEVER

THE EXPERIMENTAL TRANSMISSION OF ENDEMIC TYPHUS FEVER OF THE UNITED STATES BY THE RAT FLEA *XENOPSYLLA CHEOPIS*

By R. E. DYER, Surgeon, E. T. CEDER, Assistant Surgeon, R. D. LILLIE, A. RUMREICH, and L. F. BADGER, Passed Assistant Surgeons, United States Public Health Service

The incidence of endemic typhus fever in the United States, especially in the cities and towns of the southeastern States, has been brought to general attention in the past few years largely by the work of Maxcy (1). Whether endemic typhus of the United States is of European origin or represents an importation of Mexican tabardillo, or whether it is indigenous to the United States, is a matter of conjecture. Endemic typhus shows certain differences from the European, or epidemic, typhus, especially differences of an epidemiological nature. Epidemic typhus has its greatest prevalence in winter; it is associated with crowding; it is most prevalent in the lower strata of society; multiple cases in households, jails, and hospitals are common; and it has been shown repeatedly to be associated with lousiness.

In this

cheopis) has been

worked out in the laboratory.

The foregoing evidence points to the rat flea (*X. cheopis*) as a common vector of endemic typhus from rat to rat and from rat to man.

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OCTOBER 16, 1931, pp. 2481-2499

In this paper and an earlier one (February 13, 1931, pp. 334-338), Dr. R. E. Dyer reported that the agent for endemic typhus is the common rat flea, *Xenopsylla cheopis*.

Table 2. Type and activity of tuberculosis noted by radiologist

| Type and activity | Los Angeles | | | | Dallas | | | |
|-------------------------------------|-------------|---------|---------------|---------|-------------|---------|---------------|---------|
| | Study group | | Control group | | Study group | | Control group | |
| | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| All tuberculosis..... | 1,017 | 100.0 | 732 | 100.0 | 407 | 100.0 | 241 | 100.0 |
| Healed primary..... | 64 | 6.3 | 38 | 5.2 | 0 | 0 | 1 | 0.4 |
| Minimal, probably active..... | 22 | 2.2 | 8 | 1.1 | 17 | 4.2 | 10 | 4.1 |
| Minimal, activity undetermined..... | 172 | 16.9 | 87 | 11.9 | 50 | 12.3 | 38 | 15.8 |
| Minimal, probably inactive..... | 708 | 69.6 | 549 | 75.0 | 136 | 33.4 | 125 | 51.9 |
| Tuberculoma..... | 50 | 4.9 | 45 | 6.1 | 204 | 50.1 | 65 | 27.0 |
| Other and suspected..... | 1 | .1 | 5 | .7 | 0 | 0 | 1 | .4 |

that should not be correlated with variables under study.

The names of all persons whose films were considered positive by the radiologist were checked against the files of the death certificates maintained by the State health departments of California and Texas. In this way death rates were derived for the study and the control groups. Care was taken to provide the same information for each group in checking against files of death certificates. The mortality rates derived from this procedure covered approximately a 4½-year period for Los Angeles and a 2½-year period for Dallas.

Despite the fact that about the same percentages of films were probably positive on the first and second readings, the kinds of disease

in the study and control groups were, in the opinion of the radiologist, somewhat different. Since the probability of death within stated intervals varies from one disease to another, the mortality experience is presented separately for each suspected disease grouping.

Tuberculosis Suspects

A description of the films that the radiologist believed showed evidence of tuberculosis appears in table 2. The differences in the type and activity of tuberculosis in the two groups are important to the study insofar as they affect the mortality experience of persons with suspected tuberculous lesions.

For the Los Angeles films, the differences

Table 3. Number of tuberculosis suspects and deaths¹ observed in Los Angeles and Dallas, by age and sex

| Age | Study group | | | | Control group | | | |
|------------------|-------------|--------|----------|--------|---------------|--------|----------|--------|
| | Male | | Female | | Male | | Female | |
| | Suspects | Deaths | Suspects | Deaths | Suspects | Deaths | Suspects | Deaths |
| All ages..... | 620 | 23 | 804 | 18 | 456 | 30 | 517 | 23 |
| 15-24..... | 46 | 0 | 52 | 0 | 29 | 0 | 24 | 0 |
| 25-34..... | 88 | 2 | 114 | 0 | 50 | 0 | 45 | 0 |
| 35-44..... | 114 | 2 | 151 | 2 | 68 | 0 | 79 | 0 |
| 45-54..... | 123 | 5 | 193 | 5 | 99 | 3 | 86 | 2 |
| 55-64..... | 136 | 6 | 166 | 4 | 96 | 13 | 119 | 7 |
| 65-74..... | 85 | 8 | 103 | 4 | 78 | 8 | 113 | 6 |
| 75 and over..... | 28 | 0 | 25 | 3 | 36 | 6 | 51 | 8 |

¹ Excluding 3 deaths due to violence.

County Tuberculosis Associations, the Los Angeles County X-ray Survey Foundation, and the Public Health Service.

The second readings of the X-ray films were done by physicians with training and orientation similar to that of the original readers. In neither instance were the readers qualified as radiologists, although they had received training in reading chest photofluorograms, with emphasis on the detection of tuberculosis.

The second readings were not in many instances done by the same physicians as those who did the first. Moreover, the conditions of the second readings were quite different from those of the first. The criteria used for classifying abnormalities on the two readings therefore probably differed. For this reason, one of us (B. K.), a radiologist, re-read all films called positive on only one of the two readings and prepared a detailed description of any abnormalities observed. He reviewed the films with the knowledge that one of two readers had considered them positive but without knowing whether it had been considered positive on the first or second reading.

In the final selection of films for the study and control groups, only the radiologist's interpretations were used. Relying on a single reader's observations provides some assurance that the same criteria were used to describe abnormalities for both groups. For example, it is possible that tuberculoma was defined somewhat differently by the first and second sets of readers. Having a third reader define tuberculoma for both the study and control

groups and using only his readings in comparing the two groups tend to minimize the effect of any differences in criteria. In addition, using only the films designated positive by the radiologist increases the likelihood that the abnormalities were truly pathological. The films called positive by the radiologist are, in fact, films that have been considered positive by two out of three readers.

The results of the first reading, the second reading, and the radiologist's review are shown in table 1. The first and second readings were made at about the same level of suspicion: 7,644 films (3,670+3,974) were considered positive at the time of the surveys, and 7,612 films (3,974+3,638) were considered positive on the second reading. The percentages of the positive films confirmed by the radiologist were about the same for the two readings, 87.5 for the first and 85.0 for the second.

The percentage confirmation for the second reading excludes 379 of the Los Angeles films not read by the radiologist. These films were not read because the names of the persons, essential for obtaining mortality information, were not legible on the photofluorograms. Since the entire file of records for 1,700,000 persons examined in this survey was in alphabetical order, it was virtually impossible to identify individuals from the film number (which was legible). Omission of these films should not bias the study results since the illegibility of the name was due to poor positioning of the survey records in the photo-identifier of the X-ray machines, a circumstance

Table 1. Results of re-reading 70 mm. photofluorograms taken in two communitywide chest X-ray programs

| Survey area | Total films re-read | Positive on first reading only | | Positive on both readings | Positive on second reading only | |
|-------------------|---------------------|--------------------------------|---------------------------------------|---------------------------|---------------------------------|---------------------------------------|
| | | Total | Confirmed by radiologist ¹ | | Total | Confirmed by radiologist ² |
| Both surveys..... | 208, 555 | 3, 670 | 3, 179 | 3, 974 | ³ 3, 638 | 2, 772 |
| Los Angeles..... | 108, 409 | 1, 883 | 1, 647 | 2, 207 | ¹ 1, 964 | 1, 488 |
| Dallas..... | 100, 146 | 1, 787 | 1, 532 | 1, 767 | 1, 674 | 1, 284 |

¹ The study group, that is, persons given the "benefits" of casefinding.

² The control group, that is, persons from whom the benefits of casefinding were withheld.

³ 379 of these films were not reviewed by the radiologist.

Table 4. Cause of death for tuberculosis suspects, Los Angeles and Dallas

| Cause of death | Total | Study group | Control group |
|---|-------|-------------|---------------|
| All causes..... | 97 | 43 | 54 |
| Tuberculosis..... | 1 | 1 | 0 |
| Malignant neoplasms..... | 19 | 13 | 6 |
| Cardiovascular disease ¹ | 62 | 21 | 41 |
| Vascular lesions of | | | |
| C. N. S..... | 8 | 1 | 7 |
| Diseases of the heart..... | 52 | 18 | 34 |
| Arteriosclerotic heart disease..... | 40 | 13 | 27 |
| Hypertension with heart disease..... | 6 | 2 | 4 |
| Other heart disease..... | 6 | 3 | 3 |
| Other cardiovascular disease ¹ | 2 | 2 | 0 |
| Accidents, suicide, homicide..... | 3 | 2 | 1 |
| All other causes..... | 12 | 6 | 6 |

¹ Includes 1 death from cardiovascular syphilis.

deaths is very small, the Los Angeles and Dallas data have been combined. The results for the combined groups appear to be approximated when each city-county group is considered separately.

In the age groups 45-64 and 65 and over, persons with X-ray evidence of tuberculosis who were given the "benefits" of casefinding had considerably lower death rates than those who were not. The difference in the age group 45-64 is statistically significant at the 5 percent level, using a one-tailed test of the hypothesis that the death rates were the same ($P=0.0274$). Whether the absence of deaths in the control

groups aged 15-44 has meaning or is due to the small number (295) of persons in these groups cannot be determined. The age-sex-race-adjusted death rate for all ages was 3.13 per 100 for the study group during the 2½- to 4½-year period, or about a third lower than the comparable rate of 4.73 per 100 for the control group. This difference is statistically significant at the 5 percent level (one-tailed test, $P=0.0262$).

Only one of the deaths observed among the tuberculosis suspects was coded to tuberculosis as the underlying cause (table 4). Two-thirds were ascribed to cardiovascular disease. Death rates for all causes were as high as or higher than the expected rate, based on death rates observed in the United States in 1950, in all age groups except 65 and over. Considering that all persons in this study were in sufficiently good health to participate in a communitywide chest X-ray program (suggesting that the expected deaths might be somewhat lower than for the United States as a whole) and that the procedures used in matching survey records with death certificates probably caused an understatement of the true death rates, the abnormalities discovered on the X-ray films undoubtedly had an effect on the mortality experience.

Any reduction in death rates among those suspected of having disease would, of course, be the result of medical and nursing care given them. In both Los Angeles and Dallas, followup of tuberculosis suspects was fairly complete. While data were not obtained spe-

Table 5. Type and degree of cardiovascular abnormality noted by radiologist

| Type and degree of enlargement | Los Angeles | | | | Dallas | | | |
|---|-------------|---------|---------------|---------|-------------|---------|---------------|---------|
| | Study group | | Control group | | Study group | | Control group | |
| | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| All cardiovascular abnormalities..... | 654 | ----- | 811 | ----- | 534 | ----- | 587 | ----- |
| Cardiac enlargement (percent)..... | 412 | 100.0 | 564 | 100.0 | 325 | 100.0 | 363 | 100.0 |
| 10-20 (minimal)..... | 298 | 72.3 | 357 | 63.3 | 223 | 68.6 | 245 | 67.5 |
| 20-40 (moderate)..... | 94 | 22.8 | 159 | 28.2 | 87 | 26.8 | 93 | 25.6 |
| 10 or more (marked)..... | 20 | 4.9 | 48 | 8.5 | 15 | 4.6 | 25 | 6.9 |
| Other cardiovascular abnormalities ¹ | 242 | ----- | 247 | ----- | 209 | ----- | 224 | ----- |

¹ Without heart enlargement.

were slight. Because of a slightly greater percentage of probably active lesions in the study group, its mortality rate would probably be somewhat higher than that of the control group. It is to be expected that persons with lesions detected in a casefinding survey would have a lower mortality rate (because of the medical and nursing care subsequently provided) than those whose lesions are not detected. Thus, the presence of a greater percentage of probably active lesions in the study group would tend to minimize the difference in mortality between these two groups, and would make conservative any estimates regarding benefits to tuberculous individuals resulting from discovery in chest X-ray surveys. It was decided, therefore, not to make adjustments for differences in the types of tuberculosis included in the study and control groups in Los Angeles.

For the same reason, no adjustment will be made for an even more important difference in types of abnormalities present in the study and control groups in Dallas. Here the difference was due almost entirely to the preponderance of tuberculomas in the study group, and the presence of these would tend to raise the death rate in this group.

The number of tuberculosis suspects and the number of deaths among them for the study and control groups are given in table 3. Adjusted death rates for broad age groups are shown in figure 1. The death rates within these broad age groups have been adjusted for age (10-year groupings), sex, and race (white and nonwhite) differences between the study and control groups. The adjustment was made by the direct method using a standard population consisting of the sum of the study and control group populations. Because the number of

Figure 1. Mortality experience for tuberculosis suspects: percentages adjusted for age-sex-race differences within age groupings.

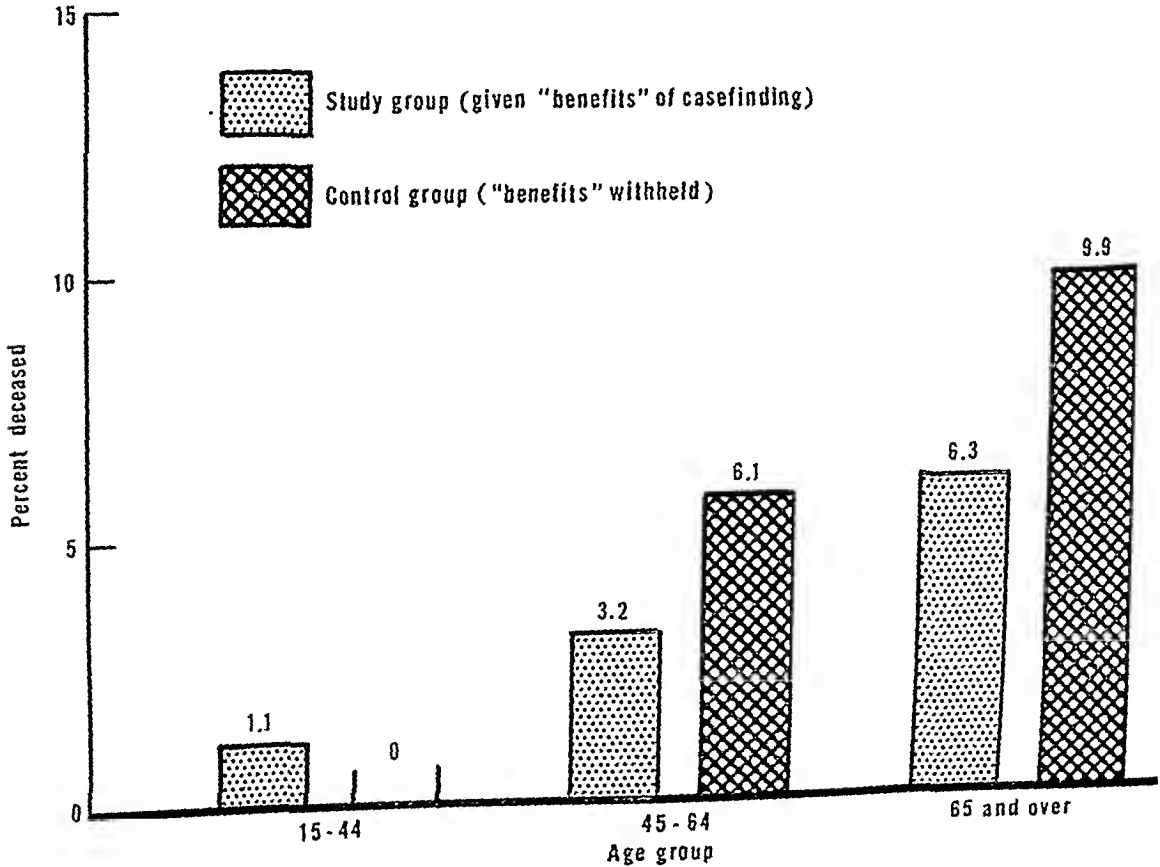


Table 6. Number of cardiovascular disease suspects and deaths¹ observed in Los Angeles and Dallas, by age and sex

| Ages | Study group | | | | Control group | | | |
|------------------|-------------|--------|----------|--------|---------------|--------|----------|--------|
| | Male | | Female | | Male | | Female | |
| | Suspects | Deaths | Suspects | Deaths | Suspects | Deaths | Suspects | Deaths |
| All ages..... | 480 | 42 | 760 | 40 | 497 | 67 | 905 | 60 |
| 15-24..... | 17 | 0 | 27 | 0 | 6 | 0 | 16 | 0 |
| 25-34..... | 21 | 0 | 50 | 0 | 19 | 1 | 36 | 0 |
| 35-44..... | 42 | 1 | 72 | 0 | 27 | 1 | 62 | 2 |
| 45-54..... | 85 | 6 | 188 | 8 | 88 | 9 | 180 | 3 |
| 55-64..... | 148 | 17 | 202 | 10 | 144 | 22 | 235 | 11 |
| 65-74..... | 110 | 10 | 174 | 15 | 143 | 23 | 266 | 23 |
| 75 and over..... | 57 | 8 | 47 | 7 | 70 | 11 | 110 | 21 |

¹ Excluding 4 deaths due to violence.

about 15 percent lower than the comparable rate of 8.39 per 100 for the group of cardiovascular suspects overlooked in the survey. This difference is not statistically significant (one-tailed test, $P=0.1190$).

Again, any benefit to persons suspected of having a cardiovascular abnormality would presumably result from medical and nursing care. In Los Angeles, a followup program was established for cardiovascular suspects. Of those considered abnormal on a confirmatory

70 mm. X-ray, a diagnostic report was obtained by the health department on 78 percent (6). As with the tuberculosis suspects, data were not obtained specifically on the extent of followup and treatment given the study group used in this report. In Dallas, persons with abnormal photofluorograms were referred to their physicians for diagnosis and treatment, but no intensive followup was made by the health department to obtain diagnostic reports.

Other Diseases

There were too few cases in any other disease category to make analysis productive. There were, for example, only 411 photofluorograms on which the presence of a tumor was suspected by the radiologist. Of these, 231 were detected in the X-ray surveys but not on re-reading, and 7, or 3 percent, died during the followup period. Of 180 missed in the survey but detected on re-reading, 7, or about 4 percent, died.

Discussion

Theoretically, it was possible in this study to make the study and control groups identical (except for chance variation) by exact matching of all factors that could cause bias between the first and second film readings. These factors were the abnormalities appearing on the film itself and the person's age, sex, and race. Since no other information was available to

Table 7. Cause of death for cardiovascular disease suspects, Los Angeles and Dallas

| Cause of death | Total | Study group | Control group |
|---|-------|-------------|---------------|
| All causes..... | 213 | 86 | 127 |
| Malignant neoplasms..... | 29 | 13 | 16 |
| Cardiovascular disease ¹ | 156 | 57 | 99 |
| Vascular lesions of | | | |
| C. N. S..... | 36 | 13 | 23 |
| Diseases of the heart..... | 116 | 42 | 74 |
| Rheumatic heart disease..... | 7 | 2 | 5 |
| Arteriosclerotic heart disease..... | 86 | 31 | 55 |
| Hypertension with heart disease..... | 13 | 6 | 7 |
| Other heart disease..... | 10 | 3 | 7 |
| Other cardiovascular disease ¹ | 4 | 2 | 2 |
| Accidents, suicide, homicide..... | 4 | 4 | 0 |
| All other causes..... | 24 | 12 | 12 |

¹ Includes 1 death from chronic nephritis.

cifically on the extent of followup and treatment given the study group in this report, it is known that for all tuberculosis suspects referred, a final diagnosis was received by the health department on 90 percent in Los Angeles and on 81 percent in Dallas.

Cardiovascular Disease Suspects

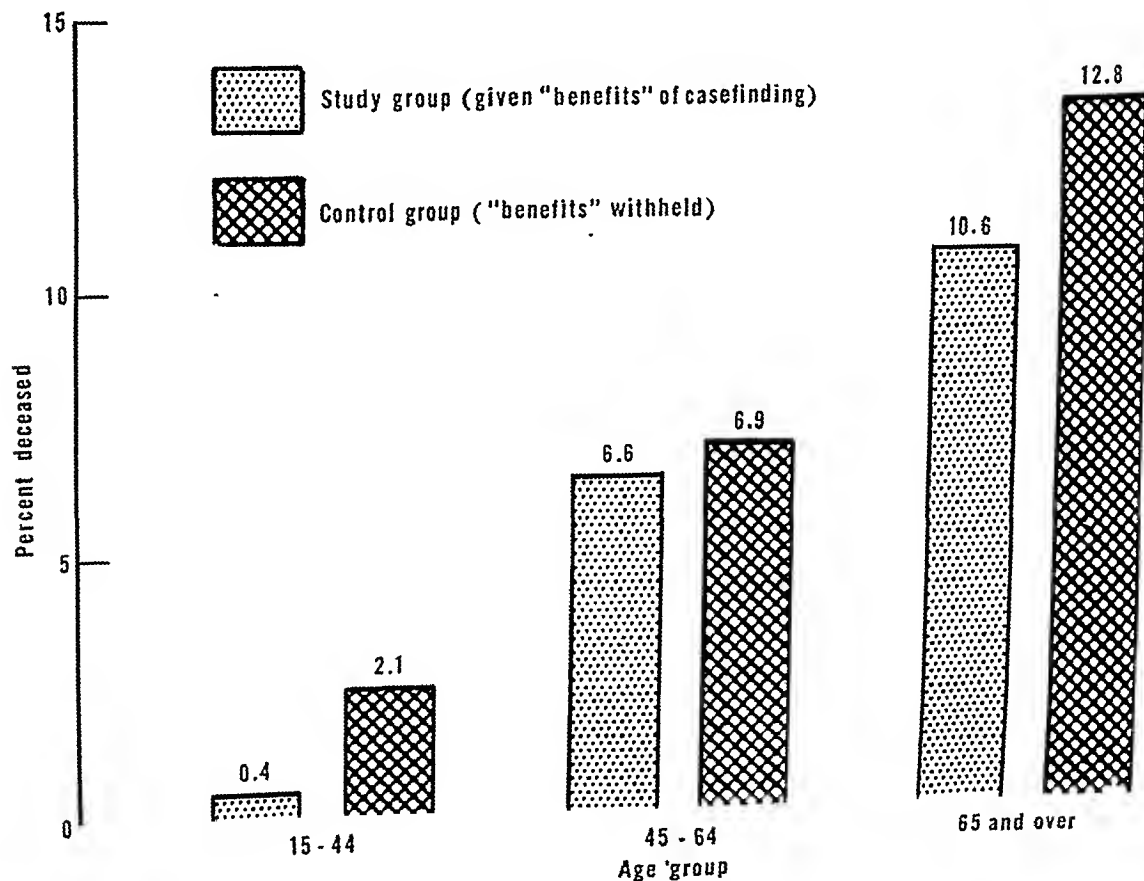
The readings for the films in which the radiologist found evidence of a cardiovascular abnormality are shown in table 5. For films from Los Angeles there was a greater degree of heart enlargement in the control group than in the study group. Thus, a higher mortality rate might be expected in the control group even if there were no benefits derived from casefinding. This difference in degree of heart enlargement was associated with a difference in the age distribution of the Los Angeles population and

was compensated for by an age adjustment of the death rates.

Table 6 gives the number of cardiovascular suspects and the number of deaths for the study and control groups, and figure 2 shows death rates for broad age groups. As in figure 1, the rates have been adjusted for age, sex, and race differences in the two populations. Of the total 213 deaths observed none was due to tuberculosis; 156, or 75 percent, were due to cardiovascular-renal disease (table 7).

In each age group death rates were lower for those persons with suspected cardiovascular abnormalities given the benefits of casefinding than for the corresponding control group. None of the differences is statistically significant, however. The age-sex-race-adjusted death rate for all ages in the group of cardiovascular suspects given the benefits of discovery in a chest X-ray program was 7.16 per 100, or

Figure 2. Mortality experience for cardiovascular disease suspects: percentages adjusted for age-sex-race differences within age groupings.



A study group and a control group were constructed on the basis of a second reading several years later of 208,555 70 mm. photofluorograms taken in two communitywide chest X-ray surveys. This second reading made possible the identification of 3,638 persons considered negative at the time of the survey but positive when the films were re-read and 3,670 persons considered positive at the time of the survey and negative when the films were re-read. Of those considered negative at the time of the survey but positive on second reading, a reviewing radiologist considered 3,179 as positive (control group). Of those considered positive at the time of the survey but negative on second reading, he considered 2,772 as positive (study group). The mortality experience of these two groups was then compared.

For persons whose chest X-ray films showed evidence of tuberculosis, the death rate was about a third lower in the study group than in the control group ($P=0.0262$). For persons whose chest X-ray films showed evidence of cardiovascular disease, the death rate was about 15 percent lower in the study group than in the control group ($P=0.1190$).

These differences may be considered rough

estimates of the benefits of chest X-ray programs.

Mimeographed copies of a more detailed report of this study, including additional tables, are available from Philip E. Enterline, Heart Disease Control Program, Division of Special Health Services, Public Health Service.

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New Division at National Institutes of Health

A Division of General Medical Sciences, headed by Dr. G. Halsey Hunt, has been formed at the Public Health Service's National Institutes of Health. The new division will administer research grants in the basic sciences and other fields, support training in the same fields through fellowships and training grants to colleges, and administer the Center for Aging Research. The first two functions have been transferred from the Division of Research Grants; the third from the National Heart Institute.

In line with these changes, the Division of Research Grants will study and evaluate all research grant and fellowship programs at the National Institutes of Health. It will continue to review, for all institutes and divisions, applications for grants and fellowship awards, and continue to process and pay grant and award funds. Dr. Ernest M. Allen will continue as chief of the Division of Research Grants.

the readers, no other factors could influence their decision on a particular film. Differences in age-sex-race distributions were compensated for by adjustment of the death rates, while effects of differences in criteria for classifying abnormalities among film readers were minimized by having the films reviewed independently and classified by a third reader.

Even with exact matching of the study and control groups, another factor that might affect the observed death rates is the mobility of the populations. Only files of death certificates in California and Texas were checked; hence, differences in death rates might have been due to a greater tendency for persons in the study group than for persons in the control group to die in another State. To check on this possibility, death rates observed during the first calendar year following the chest X-ray programs were compared for the study and control groups. Since death certificates for persons living in a State less than a year are allocated to the State of previous residence, the first year's mortality experience should be relatively free of bias due to departure from the State. It was found that differences in death rates during the first year were of about the same magnitude for the tuberculosis suspects and for the cardiovascular disease suspects as differences for the entire followup period. It would appear, therefore, that the lower death rate reported in the study group was not due to a larger out-migration of that group.

The fact that the control group was sent a negative report creates certain misgivings in making inferences as to the expected reduction in mortality for the tuberculosis suspects. While this report stated simply that the film "appeared satisfactory" and recommended an annual chest X-ray film, it may have deferred diagnosis and thus have worked to the disadvantage of the individual involved. There is no way of estimating the importance of this factor from the available data. If it exists, it may be offset by the imperfect matching for pathology between the study and control groups. As was noted above, this imperfect matching should have made the estimate of a third reduction in mortality conservative.

The problem of the negative notification is probably not so important for the cardiovas-

cular disease group, since the chest X-ray surveys used for this study were not generally publicized as casefinding devices for heart disease. Thus, receipt of a negative notification was not likely to be interpreted as absence of heart disease.

Whether estimates derived here of the extent to which individuals are better off as the result of participating in chest X-ray programs apply to all those identified in the programs or only to those persons with obscure or equivocal lesions is problematical. It might be argued that, if the benefits in case finding accrue largely because the disease found is in an early stage, and therefore is readily amenable to treatment, one would expect that persons with the very type of lesion with which this study is concerned would receive the greatest benefit.

This argument is probably more valid for cardiovascular disease than for tuberculosis. Under current treatment procedures for tuberculosis it is likely that nearly all clinical cases detected in a chest X-ray program benefit and that, in terms of averting death in the immediate future, persons with advanced disease benefit more than those with minimal disease.

From a statistical standpoint evidence of any benefit derived from the discovery of cardiovascular disease on chest X-ray surveys is weak. For tuberculosis, on the other hand, the results seem fairly conclusive. Possibly even larger differences in death rates would have been observed if it had been possible to reduce the study groups to the somewhat smaller number who actually received medical care and if appropriate control groups could have been identified for comparison. The study groups used here were, of course, diluted by some persons who were either considered essentially negative when a confirmatory film was taken or who were not kept under medical observation and treatment for other reasons.

Summary

A study was undertaken to test the assumption that persons with disease who are detected in casefinding programs are "better off" than they would have been had they not been detected.

radiation to health in general. The Assembly requested the Organization to cooperate with the International Atomic Energy Agency in health matters of mutual interest to avoid overlapping or duplication of effort.

Smallpox Eradication

The Director-General was asked to study the possibilities and practical implications of universal smallpox eradication, taking into account financial, administrative, and technical factors. He is to report his findings at the January 1959 meeting of the Organization's Executive Board. Governments throughout the world were urged to continue to fight smallpox with vaccination and revaccination campaigns, and medical scientists were called upon to work toward the production of improved vaccine resistant to the influence of temperature.

The U.S.S.R., which sponsored this resolution, announced that it was donating 25 million doses of smallpox vaccine to WHO; Cuba offered 2 million doses annually. The resolution proposed that WHO carry out preparatory work in 1958 to search for the best methods for worldwide eradication. It recommended mass vaccination in 1959-60 in countries where the principal endemic foci of smallpox exist, and additional vaccination and revaccination in 1961-62 of the population in which the disease persists.

Research

The Assembly requested that a special study be made of the role of WHO in research and of ways in which the Organization might assist more adequately in stimulating and coordinating research and developing research personnel. The United States Government is donating \$300,000 to set up studies of ways and means to promote research. Dr. Milton Eisenhower, personal representative of the President, made this offer in his address to the Tenth Anniversary Commemorative Session of the World Health Organization.

Sports Medicine

The Assembly called for studies to be made in collaboration with the International Federation of Sports Medicine, a nongovernmental agency which has official relations with WHO.

The studies will include the role of exercise and physical training in a constructive health program. The Netherlands and Canada opposed the action on the ground that the Organization's budget is too slender to divert funds from more urgent needs.

Poliomyelitis

A number of countries reported on the successful use of the Salk killed-virus vaccine. Some delegates complained that the high cost of the vaccine prevented its extensive popular use in their countries. The Assembly showed interest in extensive experiments underway in immunization through the use of orally administered, attenuated live-virus vaccine.

Survey of World Health

The Organization has compiled a comprehensive survey covering 1954-56 of health conditions throughout the world. It contains descriptions and appraisals of health programs completed or in progress in 157 countries and territories embracing 76 percent of the world's population. The Assembly asked that a second report with information covering 1957-60 be ready for submission to the 1962 World Health Assembly.

Voting Future Budgets

The Assembly decided that future Organization budgets must be approved by a two-thirds majority rather than a simple majority. During the debate the Director-General said that this idea had been considered and rejected by the framers of the WHO constitution. He saw in this step the danger of creating a precedent, changing an essentially organizational matter merely by altering the rules of procedure. The prevailing view was that a two-thirds majority would strengthen the hands of representatives when they seek budget funds for the Organization in their respective countries.

Elections

The Assembly elected as president for 1 year Dr. Leroy E. Burney, Surgeon General of the Public Health Service (United States); as vice presidents, Dr. J. Anouti, Director-General, Ministry of Public Health (Lebanon),

We look to the World Health Organization with confidence as a proven instrument through which the nations and the peoples of the world can combine their efforts, in friendship, toward the building of true peace.

—Dwight D. Eisenhower.

Eleventh World Health Assembly

The Eleventh World Health Assembly, meeting in Minneapolis, Minn., May 28–June 13, 1958, adopted a 1959 public health program of 800 projects, touching nearly every country and territory in the world. Delegates of the 88 member states of the World Health Organization voted a budget of \$14,287,600 to carry out this work.

Major Assembly actions provided for the extension and intensification of the global eradication of malaria, a comprehensive WHO undertaking in the health aspects of atomic energy, measures for the worldwide eradication of smallpox, greater emphasis on research, and studies in sports medicine.

Malaria Eradication

Delegates reported that malaria eradication is being extended and is underway in 76 countries, containing one-third of the world population. However, because much greater international financing is essential to the success of this campaign, the Assembly authorized the Director-General to seek funds from foundations, industry, labor organizations, institutions, and individuals, as well as governments. WHO's Malaria Eradication Special Account contains only a little more than \$5 million, sufficient only for 1958 activities. UNICEF, which con-

tributed \$8 million to this effort in 1957 and in 1958 and has earmarked a similar amount for 1959, will halve its contribution in 1960.

The delegate of the Soviet Union announced that his government would donate 1,000 tons of DDT to WHO and could make available technically qualified experts to promote eradication of malaria. The Assembly requested the Organization to extend research, particularly in the phenomenon of mosquito resistance to insecticides.

Health Aspects of Atomic Energy

A resolution, unanimously approved by the Assembly, directs the Director-General to investigate methods in dealing with health hazards implicit in the peaceful uses of atomic energy. He is to report especially on methods for ascertaining and recording the exposure of individuals to all radiation sources, for determining the relationship between radiation dosage and congenital defects, and for notifying public health authorities of congenital defects which could be caused by radiation.

The resolution also opens the way for the Director-General to aid underdeveloped countries in the use of radionuclides in medicine, and for a study of the effect of radiation on human heredity and of the relationship of

The First 12 Years of WHO

THOMAS PARRAN, M.D., LL.D., Sc.D., Dr.P.H.

At the Eleventh World Health Assembly Dr. Thomas Parran received the Leon Bernard Foundation Prize for outstanding achievement in social medicine. The award, established by the League of Nations and administered by WHO, was presented to him in recognition of his contributions to public health in the United States, particularly control programs for venereal disease, tuberculosis, and cancer, and Federal assistance to States for hospital planning and construction.

Dr. Parran, first dean of the Graduate School of Public Health, University of Pittsburgh, and Surgeon General of the Public Health Service from 1936 to 1948, has recently assumed direction of the Avalon Foundation.

Other recipients of the prize have been Prof. René Sand (Belgium), Prof. C.-E. A. Winslow (United States), Dr. Johannes Frandsen (Denmark), Prof. Jacques Parisot (France), Andrija Stampar (Yugoslavia), and Prof. Marcin Kacprzak (Poland).

NO GREATER HONOR can come to anyone in public health and social medicine than to receive the Leon Bernard Foundation award. This is particularly true when one reviews the role of honor of those who have earlier received the award and when one considers that it is voted by the World Health Assembly, representing the world health leaders of our time.

I accept the award with deep gratitude and humility.

My first contact with international health affairs was in 1926, when I was selected as one of 12 young medical officers from 11 different countries to engage in a study tour of Denmark for some months, following which we spent a week in Geneva to report upon our experiences and to learn about the work of the health section of the League of Nations. For me, this was a great educational experience. Since then, I have continued to learn about

international health in many capacities. Each of these experiences has broadened my understanding of the needs for, and the possibilities of, international cooperation in the field of health and of technical assistance generally.

In July 1946, at the signing of the constitution of the World Health Organization, I said that we were "signing a Magna Carta for health which will bring into being a World Health Organization unique in its scope, authority, and functions." I ventured to forecast the successive steps which WHO would take during the years ahead. These included "help in healing the wounds of war and eliminating the ancient human plagues, such as malaria and cholera, tuberculosis and syphilis. Prevention of disease is a first objective.

"To attain freedom from want of food is another goal which we may hope to reach by pooling our nutritional knowledge with the food and agricultural efforts of the United Nations.

"A next step toward world health is the positive improvement of health. Higher levels of physical development, a longer, more productive, more vigorous life span will be sought and attained.

"But prevention, treatment, and control of disease should be supplemented by intensive research in the laboratory, at the bedside, and in the field to push back the frontiers of the unknown in the health sciences."

Also, I said, "In our Magna Carta for health, we have ventured to declare that we have a contribution to make to the central world problem of today, which is to help man learn to live harmoniously with his fellow man. In making this proposition, I for one believe that health science must share the task with religion and education."

I concluded by saying, "The World Health Organization is, therefore, a collective instru-



Three Surgeons General of the Public Health Service, two past and the incumbent, were among delegates to WHO's Tenth Anniversary Commemorative Session in Minneapolis, May 26-28, 1958. From left to right: Dr. Leonard A. Scheele, Dr. Thomas Parran, and Dr. Leroy E. Burney. Dr. Burney presided over the Eleventh World

Health Assembly, which met May 28-June 13, 1958. Dr. Scheele is a past president of the Assembly, and Dr. Parran was one of the signers of the original charter of the World Health Organization. The World Health Organization met in this country at the invitation of the United States, following appropriate action by Congress.

Dr. A. Sauter, Director of Public Health (Switzerland), and Dr. Tran Vy, Health Minister (Vietnam); as chairman of the Committee on Program and Budget, Prof. N. N. Pesonen, Director-General of the State Medical Board (Finland); and as chairman of the Committee on Administration, Finance and Legal Matters, M. S. Khanachet, member of the Saudi Arabian Legation in Bonn.

Executive Board

The 18-member Executive Board as constituted after elections by the Assembly includes Afghanistan, Australia, Brazil, Canada, Federal Republic of Germany, France, Guatemala, India, Iran, Italy, Liberia, Mexico, Tunisia, U.S.R.R., United Arab Republic, United States of America, United Kingdom, and Vietnam.

Membership and Finances

Membership in the World Health Organization has grown from 26 countries in 1948 to 88 at present. Two new member states are the Federation of Malaya and the United Arab Republic. Czechoslovakia resumed active status in the Organization in 1958.

In addition to the \$14,287,600 voted for the 1959 budget, WHO received a supplemental \$6 million of United Nations Technical Assistance funds, and nearly \$9 million was contributed to the special malaria eradication funds of the Organization and its regional representative, the Pan American Sanitary Bureau. The 1957 collection of contributions from active members reached 97.08 percent, a record in the history of WHO, according to the External Auditor's Report.

with emergingly known genetic behavior, and disease agents of grave seriousness. Who has jurisdiction here? Is it the physical scientist, the biologist, or the physician? Clearly, we need to submerge the old distinctions and preserve the interrelations and wholeness of nature.

There has been a long transition from the primitive ritual of the medicine man to today's medicine of the sciences. The expansion of medical knowledge and teaching in recent years has been dominated by the scientific discipline of medicine itself and by segments of knowledge drawn from other sciences, so that today biological and natural sciences have become the very matrix of medical thought. Physics, chemistry, and biology are its language and tools.

The past century has been called the era of the biological and the physical scientist, but today we may be entering the century of the psychological or of the physiological-sociological-anthropological man. Perhaps in the next century the first half of this one will be noted as the period in which society moved away from its preoccupation with man solely as an economic creature.

Public health has been termed "an applied technology resting upon the joint pillars of natural science and social sciences." During the past century the natural science pillar has been greatly strengthened, but until both the pillars are strong the arch of public health will not be firm. Now, consideration also is being given to the social aspect of the environment, especially as it interacts with biological and physical stresses. Since stress effects are both psychological and physiological, emphasis must be given to fuller understanding of psychological factors in stress and disease reactions.

My colleague, Dr. Robert E. Olson, draws attention to the problems facing public health: "The biochemist who studies the kinetics of a purified enzyme system has only a few variables to control; the physiologist who studies the metabolism of an intact organ in an animal has many more to consider; the physician who studies a disease process in an intact human animal has even more parameters to correlate and attempt to control in the diagnosis and treatment of his patient. But the public health scientist who is studying the behavior of popu-

lations is dealing with an infinitely complex situation, to which, in many instances, only statistical solutions are possible."

In the past, certain factors known to affect public health adversely could be engineered out of the physical environment. Today, there is needed a revealing analysis of the social environment which blocks the way of abundant public health. Most of the degenerative diseases, which constitute our major health problems, have psychosocial components. The so-called psychosomatic diseases such as hypertension, peptic ulcer, rheumatoid arthritis, thyrotoxicosis, and schizophrenia have direct psychiatric determinants; others such as obesity, alcoholism, and coronary artery diseases have at least indirect relations to sociocultural patterns of diet, anxiety reduction, and stress.

Public health needs to be increasingly concerned both in research and in teaching with a comprehensive ecologic approach to problems of disease and of health if we are to be successful in understanding better the degenerative diseases and mental illnesses. The clinician must expand his horizon to include the role of the family and the community in relation to the disease problem at hand. By the same token, the public health scientist must not be content solely with statistical solutions and epidemiological inferences in his analysis of these knotty problems. The meeting ground is the interdisciplinary team play of a group from many fields of science, in sympathetic agreement with each other, and with access to the experimental laboratory, the patient, the family and the community, if need be, in the pursuit of the problem under study.

Those of us who use epidemiological and biostatistical methods primarily should remember that acute clinical observation may supply the clue, even though it be made only on one patient. Claude Bernard, French physiologist, once said, "I do not reject the use of statistics, but I condemn not trying to go beyond them" (quoted in the *New York Times*, E-9, April 13, 1958).

It is recognized that epidemiology does not deal solely with infectious diseases. It was through epidemiological investigations that the nature of pellagra and of goiter was discovered. There is an epidemiology of suicides, of acci-

ment which will promote physical and mental vigor, prevent and control disease, expand scientific health knowledge, and contribute to the harmony of human relations. In short, it is a powerful instrument forged for peace."

The goals set for the World Health Organization represented the highest aspirations of the human spirit. Few of us believed that they could be reached fully and in a short time span; but we should never lose sight of them. It is a source of great satisfaction that we have moved "ten steps forward." They have been 10 important steps which might be described more accurately as 10 times 10. That such substantial progress has been made is all the more remarkable when we consider the continued unsettled conditions in world affairs during these past 12 years. For what has been accomplished, primary credit is due to the competent leadership of the first two Directors-General, Dr. G. Brock Chisholm and Dr. M. G. Candau. Credit goes also to the staff in Geneva and in the regional offices, as well as to the delegates to the 11 annual health assemblies and the members of the Executive Board.

In retrospect, I think that a sound decision was taken at the First World Health Assembly to limit the initial objectives and programs to urgent problems of worldwide importance. These were control of malaria and tuberculosis as well as important acute communicable diseases, the improvement of nutrition, measures to promote maternal and child health, and sanitation of the environment.

It is gratifying that the initial programs have been intensified through a somewhat larger central budget and through the Expanded Programme of Technical Assistance, and that the substantial resources of UNICEF have been joined in promoting some of the important objectives of the World Health Organization.

From the outset, education and training have played important roles—8,000 WHO fellowships attest to this—and the more recent concern both of the United Nations and the World Health Organization with atomic energy in relation to health recognizes the importance of this new factor in man's environment.

Because of my preoccupation with the advancement of the health sciences through

research and the training of future workers, both in the general field and in a number of its subdivisions, what I have to say will naturally center about this experience.

In May 1957, we held a series of seminars in Pittsburgh as a part of the ceremonies inaugurating our new chancellor and dedicating our new School of Public Health building. The themes were "Contributions of the Sciences to Public Health in the Years Ahead" and "Fusion of the Sciences for Better Health." I shall try to summarize some of the conclusions.

Viewing the sciences in historic perspective, one can detect periodicity. There have been periods of fusion and the reverse, a disintegration of effort. In the earliest period, the natural philosophers were the universal scientists, exploring all of life in order to gain greater knowledge of its meaning. (In the future, as in the past, the philosophers will contribute to our understanding of life, of natural laws, and of the universe.)

In due course, it became possible to study one or another aspect of life and living creatures. This led to specialization by medical research and medical teaching which burgeoned until a specialist came to be defined as a person who knows more and more about less and less. There are signs that this trend is being reversed—that a scientist needs to have more than one skill under one skull—and that future progress lies through a fused spectrum of scientific knowledge. This trend, apparent in medical and public health practice, is to see man and his environment as a whole and especially to interpret the dynamic interactions in these man-environment interrelationships. In short, human ecology.

During recent years the earlier distinction between public health and medicine has been blurred; there has also been a great decrease in the earlier distinction between physical and biological science so that at present there is no boundary within the biological sciences which the physical sciences cannot usefully pass. In this process of infiltration, there is the resulting integration of all biological sciences into a continuous and more meaningful whole. The viruses are a case in point. They are inert chemicals under certain circumstances; under other circumstances, reproducing organisms

for research and for the training of individuals to deal with them. The Graduate School of Public Health at Pittsburgh is pioneering in such a program of research and in the training of new types of specialists who can combine knowledge of the traditional health sciences with the newer knowledge of nuclear technology. This expanded area of health training will be invaluable in maintaining the health of mankind as we enter nuclear competition.

While never losing sight of its long-range goals, the World Health Organization in every situation must build upon what now exists in every country and region; each step forward must be practical in the light of the limitations imposed by traditions, customs, and resources.

It is gratifying to note the trend in many countries to seek the Organization's help in working out long-term plans for a continuing development of their own health services, and the growing willingness of nations to engage in joint action with their neighbors to solve common problems.

In the Director-General's Annual Report for 1955, the importance of strengthening the national health services is stressed. There are indications that nations, large and small, are becoming increasingly aware of the value of self-help in taking responsibility for the long-range development of their own health services, and that they seek aid mainly in three directions: supplies to be used in the worldwide struggle against communicable disease, the strengthening of the services already established, and the raising of standards of education and training of all types of health workers.

Even more attention needs to be given by the World Health Organization and every member state to the collection of more accurate and more comparable health statistics. Without them the course of public health cannot be charted wisely.

I have referred to the worldwide population explosion and the need for health agencies at all levels to be concerned about it, to seek to understand better these complex phenomena, and within religious and cultural contexts to devise programs of research, education, and action to deal better with them.

There are two great drains upon the re-

sources, the manpower, and the accumulation of capital in most countries which detract from human health and well-being: expenditures to provide housing, food, clothing, and other items required for normal living by the too rapidly increasing population, and expenditures for war or the prevention of war, defense.

What a different world we could have if some of these expenditures could be diverted to the better cultivation and development of the human capital, the human resources, in each country. Health, education, recreation, and nutrition are obvious needs. Should not most of these savings be diverted to programs in each country to improve standards of health and well-being, and some funds be made available to the World Health Organization and other specialized agencies?

Specifically, I propose that all member states of the Organization, in addition to their regular contributions, take 2 percent from their annual appropriations for military purposes and use it as an extra contribution to the Expanded Programme of Technical Assistance of the United Nations, in which the World Health Organization should have a substantial share.

With such funds and the sentiment behind them, malaria eradication would be speeded up; smallpox, tuberculosis, syphilis, and yaws would be next to go. In fact, all of the ancient plagues could be conquered within a measurable number of decades. Then WHO could turn its energies more fully to improving nutrition, to promoting physical and mental vigor, to expanding scientific health knowledge, and finally to the most difficult task of all—the improved harmony of human relations.

The substance of the comments in this address was published in California Medicine 88:411-416, June 1958.

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dents, of cancer, and of atherosclerosis. Some beginnings have been made in the epidemiology of mental health and disease. I have pointed out elsewhere (1) the need for intensifying greatly these types of epidemiological studies.

When we have parallel biochemical studies, we may, by the epidemiological method, identify disease-prone individuals in a population before they become sick. Once these individuals with biochemical differences can be identified, it may be possible to control internal factors as well as the external environments and thus retard the progression of disease; almost certainly, there are such psychosocial and nutritional factors. Such knowledge may be to the prevention of degenerative disease what immunization and good sanitary engineering have been to the prevention of communicable diseases.

It is agreed that the behavioral and the biological or biochemical aspects of man are not separated by an impassable gulf.

But in our preoccupation with new and complex problems, public health workers should continue their emphasis upon traditional bases for action. We need also to apply to the newer problems the principles which have been learned from the past.

As one looks back, man has been concerned over the centuries with getting enough food to meet his metabolic needs and controlling his microbiological environments. Neither objective is met for most of the world's people. The continued growth of population, estimated at 1.6 percent per year, may continue to outrun increased food production. Consequently, public health must be concerned with problems of natality as well as with those of mortality.

The economy of scarcity has been superseded by overabundance in the United States and other western nations. Hence, we are concerned with metabolic disorders, obesity, alcoholism, and effects of smoking, which are disorders of excess rather than deficiency. Even the concept of stress as a cause of mental ill health connotes excess—the impact of more challenges than the organism is able to bear. Sir Geoffrey Vickers says, "Our hazards from excess range from excessive nuclear radiation through excessive smoking, to the excessive consumption of ice cream—products which

have in common the fact that our superabundance is our own desiring" (2).

Recently, George J. Stolnitz has reported on "A Century of International Mortality Trends." He concludes that the rise in life expectancy over the past century probably has been more far-reaching than the gains of the previous 2,000 years; that the increases in western countries in the expectation of life at birth since 1890 have been more than double the gains over the preceding half-century; and that many of the mortality trends in western life changes are "unrepeatable phenomena." It is irrefutable that major gains of the future in lifesaving must come in the ages beyond 60. In documenting this point, Stolnitz calculates that if all mortality before age 45 were eliminated, the resulting gains would be no more than half of the rises in life expectancy at birth since the beginning of this century (3).

Each new breakthrough in the health sciences and each shift in living patterns will produce additional tasks for the World Health Organization and for national health services. Certainly, we are agreed that additional responsibilities have been produced by urbanization, by industrialization, by the major threats arising from air pollution, and even from the density of automobiles on the highways. Yet none of the serious problems evoked has been solved.

Added to the familiar environmental hazards is that new factor in man's environment, nuclear fission, and its use for the production of power. The known supply of fossil fuels is inadequate. In the absence of practical methods for harnessing solar energy and for unraveling the secrets of photosynthesis, nuclear power is being developed on a huge scale. This will increase at an ever-accelerating pace with many nations getting into the act but having too little comprehension of the dangers.

The disposition of radioactive garbage poses a whole series of enigmas not yet solved by the nations most technically advanced in nuclear fission. Such problems will confront us increasingly. We must develop the organization and the personnel and, most important of all, acquire the knowledge with which to cope with these problems.

Radiation biology now offers many new fields

Intensive clinical and epidemiological studies strongly pointed to a common source of acute Salmonella reading infection occurring in more than 300 persons in widely separated areas of the United States during a 12-month period. However, no common source of infection could be identified.

Widespread Salmonella reading Infection of Undetermined Origin

ROBERT H. DRACHMAN, M.D., NORMAN J. PETERSEN, B.S., JOHN R. BORING III, M.S., and
FRED J. PAYNE, M.D.

DURING the period from September 1956 through early September 1957, 325 acute sporadic cases and 3 outbreaks of salmonellosis due to *Salmonella reading* occurred in the United States. Previous to this time *S. reading* had been rarely encountered in typing laboratories. Although the epidemiological picture strongly pointed to a common source of infection, none could be identified in spite of intensive study. This "outbreak" is an example of a phenomenon periodically noted by *Salmonella* typing laboratories when, within a few weeks, a relatively large number of cultures are received containing a serotype which has

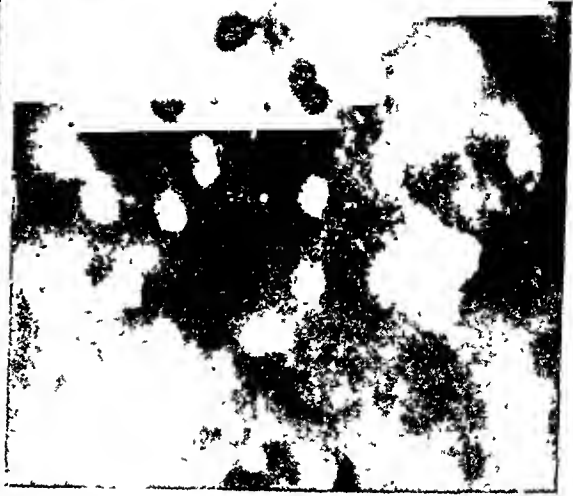
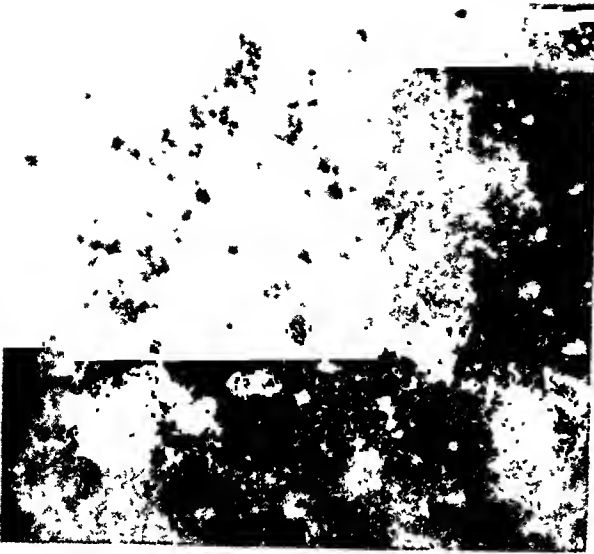
previously been encountered only rarely. This phenomenon is seldom explained except when circumscribed outbreaks of salmonellosis are clearly involved. The salient features of the 1956-57 "outbreak" follow.

The "Salmonellosis" Outbreak

In late March of 1957, Dr. Frederick H. Wentworth of the bureau of communicable diseases, Ohio Department of Health, reported 13 isolations of *S. reading*, indicating a sharp increase of this type of *Salmonella* compared with the previous experience of the health department. About half of the isolations were from blood cultures, and all came from children in widely separated areas of the State. Inquiries to Dr. Philip R. Edwards, chief of the Enteric Bacteriology Laboratory, Communicable Disease Center, and to other *Salmonella* typing centers throughout the country revealed a similar recent increase in *S. reading* isolations. Accordingly, a plan for national surveillance was instituted. A summary of available data was distributed to State health officers, epidemiologists, and laboratory directors. Requests were made for the prompt submission of epidemiological data on all instances of *S. reading* infection, with particular attention to pos-

The authors, at the time of the study, were all with the Enteric Disease Investigations Unit, Epidemiology Branch, Communicable Disease Center, Public Health Service, Atlanta, Ga. Dr. Drachman is currently chief of the unit. Mr. Petersen, sanitary engineer epidemiologist, and Dr. Payne, epidemiologist, former chief of the unit, are now with the Phoenix Field Station, Phoenix, Ariz., and Mr. Boring, bacteriologist, is with the department of bacteriology, University of Florida, Gainesville.

The paper was presented in part before the epidemiology section of the American Public Health Association at its annual meeting in Cleveland, Ohio, November 14, 1957.



Plague organisms from a mouse spleen smear, which has been stained with fluorescent antibody. On the left side, with visible light, the viewer sees a great deal of material from which it is exceedingly difficult to separate the plague organism; on the right side, with ultraviolet light, only the plague bacteria show up.

FLUORESCENT ANTIBODY TECHNIQUES

Fluorescent antibody techniques for rapid laboratory identification of pathogens, and of antibodies produced in man by these microorganisms, are under development at the Communicable Disease Center of the Public Health Service. These new diagnostic methods, which use a fluorescein dye to "light up" individual disease organisms, promise one day to enable the physician to make an accurate diagnosis of certain communicable diseases within minutes after the patient comes to his office.

In describing these methods, Dr. R. J. Anderson, chief of the Communicable Disease Center, explained that the first step is to "label" with a fluorescent dye a globulin solution containing antibodies specific to certain organisms. When dried smears made from specimens are covered with the tagged antibody solution and observed through a microscope under ultraviolet light, any homologous organisms or their products will fluoresce. The process takes a few hours or less, whereas other methods take 2 or 3 days or even sometimes weeks.

A corollary method detects antibodies rather than the actual pathogenic organisms at stages of infection when the organism is not available for identification.

These quick, relatively simple, versatile laboratory procedures may possibly apply to the identification of pathogens in all kinds of specimens either from the individual patient or from the environment. As the somewhat laborious matter of adapting them to use with different bacteria and viruses and with their respective antibodies is completed, they are expected to take an important place in the work of laboratories all over the country.

Before these procedures can come into general use, several practical problems will have to be solved, Dr. Anderson indicated. Microscopes equipped with the appropriate ultraviolet light will have to be made available, and technicians will have to be trained to use the new methods. Tight budgets also may delay the use of the fluorescent antibody techniques in many localities.

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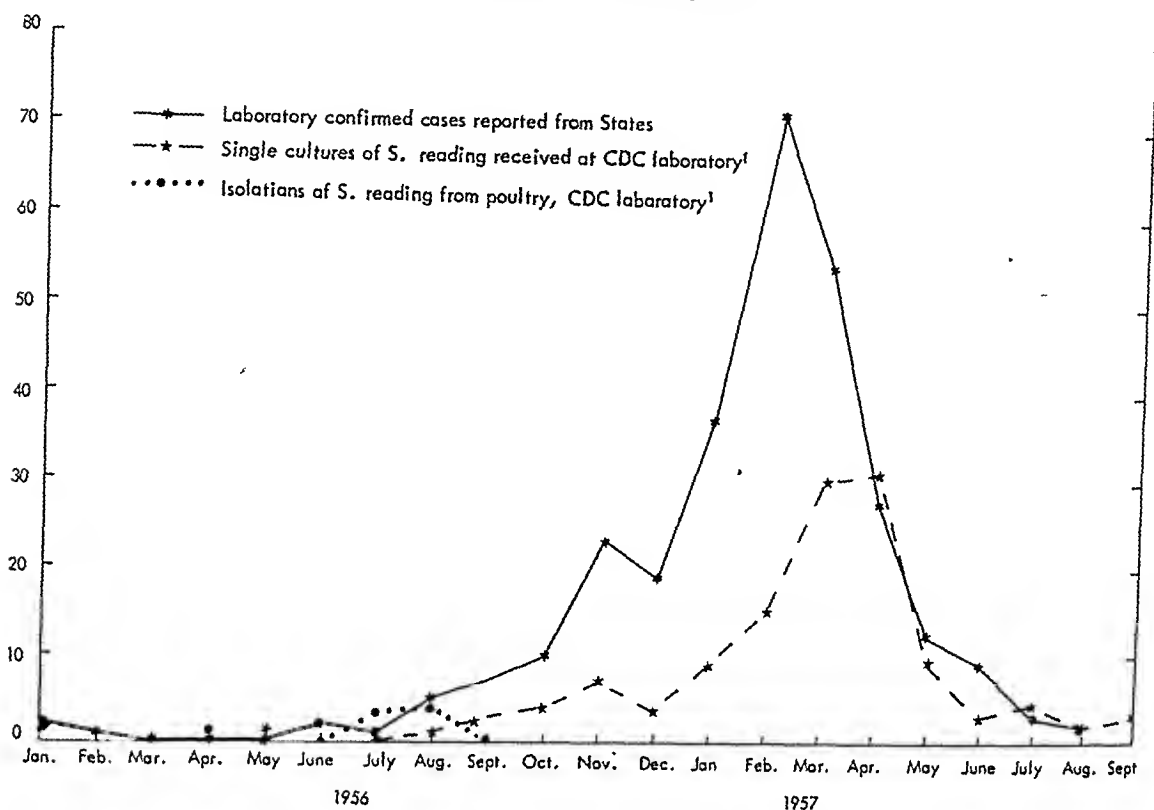
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The paper was presented in part before the epidemiology section of the American Public Health Association at its annual meeting in Cleveland, Ohio, November 14, 1957.

Month of onset of 283 cases of salmonellosis due to *Salmonella* reading, exclusive of asymptomatic carriers and secondary cases.



¹ Data provided by Dr. Philip R. Edwards, chief, Enteric Bacteriology Laboratory, Communicable Disease Center, Public Health Service, Atlanta, Ga.

sible sources of infection. A standard food history form was prepared and circulated. Several Epidemic Intelligence Service officers worked in cooperation with 11 State health departments in obtaining field data.

The chart shows the month of onset for 283 reported cases of salmonellosis due to *S. reading* for which such information was available. A total of 392 isolations of this type representing repeat cultures, family contacts, and outbreaks was reported during the same period. An early increase in cases is noted in October of 1956 with a peak in February of 1957 and a decline to previous incidence by May of that year.

Table 1 shows the distribution of the reported cases by State and month of onset. In this table, family and other group outbreaks are counted as single episodes. Cases appeared simultaneously in several widely separated areas of the country. No progression of *S. reading* isolations from one geographic area

to another is apparent. However, most positive isolations were reported from the northern tier of States. In view of the wide variation in the degree of utilization of laboratory facilities in various areas, no attempt is made to calculate attack rates.

The age distribution of 248 patients with salmonellosis due to *S. reading* for whom age data were given is presented in table 2. Cases are concentrated among infants and children, with 18 percent of the total number under 1 year of age and 11 percent under 6 months. This grouping agrees with the tabulation by MacCready and co-workers of ages for 2,092 patients with *Salmonella* infections in general (1).

Clinical and Laboratory Data

Detailed clinical and laboratory data were obtained for 69 patients, and henceforth these will be called the study group. The information is summarized in tables 3-7. Hospital records of 20 patients were abstracted, and health

department records and personal interview data were available for all 69 patients. These patients are probably not representative of persons ill with salmonellosis due to *S. reading* but for prejudicial reasons happened to have been cultured during a bout of gastroenteritis. It is striking that the vast majority of homes visited revealed families of above average income. However, this was merely an impression, and no attempt was made to evaluate the economic status of the families interviewed.

The median age of the study group was 3 years, with a range of from 1 week to 64 years

(table 3). In this respect the lower age range of the study group approximated the age distribution of the previously described group of 248 patients. More than half of the patients were hospitalized, with a median hospital stay of 8 days (table 3). Patients were reported to have been severely ill in 53 percent of the cases, 27 percent were moderately ill, and 20 percent were mildly ill (table 4). These were subjective impressions by patients and were not quantitated objectively. Symptoms persisted for a median of 7 days although the time was some-

Table 1. Distribution of 283 cases ¹ of salmonellosis due to *Salmonella reading*, by State and month of onset, January 1956–July 1957

| State | 1956 | | | | | 1957 | | | | | | |
|---------------------|----------------|-----------|---------|----------|----------|---------|----------|-------|-------|-----|------|------|
| | January-August | September | October | November | December | January | February | March | April | May | June | July |
| United States..... | 12 | 7 | 10 | 23 | 19 | 37 | 71 | 54 | 26 | 12 | 9 | 3 |
| New England: | | | | | | | | | | | | |
| Maine..... | | | | | | | 1 | | | | | |
| Vermont..... | | | | | 1 | | | | | | | |
| Massachusetts..... | | | | | | 5 | 4 | 2 | 1 | | | |
| Connecticut..... | 1 | 2 | 1 | 3 | 2 | 2 | 1 | 2 | 1 | 1 | 2 | 1 |
| Middle Atlantic: | | | | | | | | | | | | |
| New York..... | 4 | 3 | 2 | 1 | 3 | 9 | 7 | 6 | 6 | 1 | | |
| Pennsylvania..... | | | | | | | 2 | | | | | |
| East North Central: | | | | | | | | | | | | |
| Ohio..... | | | | | | 1 | 11 | 8 | 4 | | 1 | |
| Illinois..... | 1 | 1 | 2 | 2 | | 1 | | 3 | 1 | | | |
| Michigan..... | | | 2 | 3 | 2 | 6 | 13 | 5 | | | | |
| Wisconsin..... | 1 | | 1 | 5 | 2 | 2 | 2 | | 2 | 1 | | |
| West North Central: | | | | | | | | | | | | |
| Minnesota..... | | | | | | 2 | 4 | 5 | 1 | 1 | | |
| Iowa..... | | | | | 1 | | 1 | 3 | | | | |
| Missouri..... | | | | 2 | 1 | | | | | | | |
| North Dakota..... | | | | | 1 | | | | | | | |
| Kansas..... | | | | | | | | | | | | 2 |
| South Atlantic: | | | | | | | | | | | | |
| Maryland..... | | | 1 | | | | | | 1 | 5 | | |
| Virginia..... | | | | | | 1 | 1 | 1 | | | | |
| North Carolina..... | | | | | | | 1 | 1 | | | | |
| Georgia..... | | | | | | | | 3 | 2 | | 1 | |
| East South Central: | | | | | | | | | | | | |
| Tennessee..... | | | | | | | | 1 | 1 | | | |
| Kentucky..... | | | | | | | 1 | 2 | 1 | | | |
| West South Central: | | | | | | | | | | | | |
| Arkansas..... | | | | | | 1 | | | | | | |
| Louisiana..... | | | | | | | 3 | | | | | |
| Texas..... | | | | | | | 2 | | | | | |
| Mountain: | | | | | | | | | | | | |
| Wyoming..... | | | | | | | 2 | | | | | |
| Pacific: | | | | | | | | | | | | |
| Washington..... | 1 | | | | 3 | 2 | 5 | 3 | | | | |
| Oregon..... | | 1 | 1 | 2 | | | | 1 | | | | |
| California..... | 4 | | | 5 | 3 | 5 | 10 | 8 | 4 | 3 | 5 | |

¹ Secondary cases and asymptomatic carriers excluded.

Table 2. Age distribution of 248 patients with salmonellosis due to *Salmonella* reading

| Age group | Number | Percent |
|-------------------------|--------|---------|
| All ages..... | 248 | 100 |
| 6 years and under..... | 171 | 69 |
| Less than 6 months..... | 28 | 11 |
| 6-11 months..... | 18 | 7 |
| 1 year..... | 19 | 8 |
| 2 years..... | 38 | 15 |
| 3 years..... | 30 | 12 |
| 4 years..... | 18 | 7 |
| 5 years..... | 10 | 4 |
| 6 years..... | 10 | 4 |
| Over 6 years..... | 77 | 31 |
| 7..... | 4 | 2 |
| 8..... | 6 | 2 |
| 9..... | 3 | 2 |
| 10..... | 6 | 2 |
| 11-14..... | 11 | 4 |
| 15-19..... | 4 | 2 |
| 20-29..... | 7 | 3 |
| 30-39..... | 15 | 6 |
| 40-49..... | 5 | 2 |
| 50 and over..... | 16 | 6 |

what longer in the group less than 1 year of age.

Leukocyte counts were available for only 20 patients and are summarized also in table 4. The counts ranged from 3,150 to 20,000 per cubic millimeter with the median values tending to decrease with increasing age. A slight to moderate lymphocytosis is reflected in the differential counts, with the expected higher lymphocyte counts in the younger age group

All study group patients were, of course, positive for *S. reading* by stool culture. Blood cultures were made for only 8 patients. Of these, 7 cultures yielded *S. reading*. No diarrhea was reported for 4 of these 7 patients.

Elevated temperatures were reported for 94 percent of the 65 patients for whom this information was given. The median of highest recorded values was 103.2° F. (table 5). Febrile convulsions occurred in only one child, a 2-year-old girl. Diarrhea was considered present only when 5 or more stools occurred in 1 day.

Table 6 summarizes the data regarding secondary episodes of gastroenteritis in 65 exposed families. Attack rates calculated by family size revealed similar rates in all families.

Local health department personnel obtained stool cultures from family contacts in 33 households harboring index cases. *S. reading* was isolated from specimens obtained in 55 percent of these households (table 7). Mothers were positive four times more frequently than were fathers. As noted in table 6, only 5, or 23 percent, of the 22 *S. reading* positive children reported any gastrointestinal illness. However, *S. reading* was found in cultures from one-third of the children ill with gastroenteritis who were family contacts.

Among the index cases, other *Salmonella* types in addition to *S. reading* were isolated from 9 patients. These types included *S. muenchen* isolated from 3 patients, *S. paratyphi* B, from 2 patients, and *S. manhattan*, *S.*

Table 3. Hospitalization of 69 patients with salmonellosis due to *Salmonella* reading

| Age group ¹ | Total | | Hospitalized | | | |
|------------------------|--------|---------|--------------|---------|-----------------|-------|
| | Number | Percent | Number | Percent | Duration (days) | |
| | | | | | Median | Range |
| All ages..... | 69 | 100 | 35 | 51 | 8 | 2-26 |
| Children: | | | | | | |
| 0-5 months..... | 8 | 19 | 7 | 54 | 8 | 4-26 |
| 6-11 months..... | 5 | | | | 6 | 2-13 |
| 1-4 years..... | 30 | 44 | 14 | 47 | 9 | 3-18 |
| 5-9 years..... | 12 | 17 | 6 | 50 | 6 | 3-20 |
| 10-17 years..... | 10 | 15 | 5 | 50 | | |
| Adults: | | | | | | |
| 32-64 years..... | 4 | 6 | 3 | 75 | 10 | 6-14 |

¹ Median age 3 years (range 1 week-64 years).

Table 4. Severity and duration of illness and leukocyte counts of 69 patients with salmonellosis due to *Salmonella* reading

| Age group | Severity and duration of illness | | | | | | Leukocyte counts | | | | |
|------------------|----------------------------------|----------|----------|--------|-----------------|-------|------------------|----------------------------------|----------|-------------------------------|--------------|
| | Total patients | Severity | | | Duration (days) | | Number patients | 1,000 cells per cubic millimeter | | Differential (median percent) | |
| | | Mild | Moderate | Severe | Median | Range | | Median | Range | Poly-morpho-nuclears | Lympho-cytes |
| All ages..... | 164 | 13 | 17 | 31 | 7 | ----- | 20 | ----- | ----- | ----- | ----- |
| Children: | | | | | | | | | | | |
| 0-11 months..... | 13 | 2 | 3 | 8 | 14 | 5-60 | 2 | 13 | 9.7-17 | 20 | 78 |
| 1-4 years..... | 29 | 6 | 8 | 15 | 7 | 2-70 | 12 | 11.5 | 3.15-20 | 33 | 64 |
| 5-9 years..... | 9 | 2 | 3 | 4 | 8 | 3-60 | 6 | 10.35 | 5.8-11.8 | 51 | 43 |
| 10-17 years..... | 9 | 3 | 3 | 3 | 6 | 2-30 | | | | | |
| Adults: | | | | | | | | | | | |
| 32-64 years..... | 4 | ----- | ----- | 4 | 17 | 4-25 | ----- | ----- | ----- | ----- | ----- |

¹ Severity and duration of illness unknown for 5 patients.

typhimurium, *S. montevideo*, and *S. siegburg* from 1 patient each. Cultures of family contacts revealed 6 individuals with other *Salmonella* types: *S. typhimurium*, *S. bareilly*, *S. sandiego*, *S. muenchen*, and *S. oranienburg* were each isolated from one patient, and another patient was found positive for both *S. muenchen* and *S. oranienburg*. Admittedly, the usual press of laboratory work does not permit the serotyping of any large number of colonies from a single specimen. Conse-

quently, the above is only a suggestion of what other *Salmonella* types may have been present in these patients and contacts.

Food History

A summary of the responses to questions on food consumption is given in table 8. No comparable data were collected from an unaffected control population. Some difficulty was anticipated in obtaining accurate food histories since the average time lapse between the date

Table 5. Clinical characteristics of 69 patients with salmonellosis due to *Salmonella* reading

| Age group | Total | With fever | With-out fever | Median temperature (F.) ¹ | Symptoms | | | | | | | |
|------------------|-----------------|------------|----------------|--------------------------------------|-----------------------|-----------------------|--------------------------|-----------------------|----------|-----------------------|------------------|-----------------------|
| | | | | | Diarrhea ² | | Blood and mucus in stool | | Vomiting | | Abdominal cramps | |
| | | | | | Num-ber | Per-cent ³ | Num-ber | Per-cent ⁴ | Num-ber | Per-cent ³ | Num-ber | Per-cent ³ |
| Total..... | ⁵ 69 | 61 | 4 | 103.2 | 58 | 84 | 31 | 53 | 30 | 43 | 39 | 70 |
| Children: | | | | | | | | | | | | |
| 0-11 months..... | 13 | 11 | 2 | 102.4 | 13 | 100 | 9 | 69 | 3 | 23 | ----- | ----- |
| 1-4 years..... | ⁵ 30 | 24 | 2 | 103.3 | 24 | 80 | 18 | 75 | 14 | 47 | 19 | 63 |
| 5-9 years..... | 12 | 12 | 0 | 103.2 | 10 | 83 | 3 | 30 | 6 | 50 | 9 | 75 |
| 10-17 years..... | 10 | 10 | 0 | 103.8 | 8 | 80 | 1 | 13 | 5 | 50 | 7 | 70 |
| Adults: | | | | | | | | | | | | |
| 32-42 years..... | 4 | 4 | 0 | 102.4 | 3 | 75 | 0 | 0 | 2 | 50 | 4 | 100 |

¹ Highest values recorded.

² 5 or more stools per day.

³ Based on total of 69 patients.

⁴ Based on 58 patients with diarrhea.

⁵ Temperature unknown for 4 patients.

of onset of gastroenteritis and that of the interview was 8 weeks. Recall of specific foods eaten prior to onset of the illness, therefore, appeared to be an unrealistic expectation. Consequently, an enumeration of the family's usual food intake was requested. Families were looked upon as a unit in terms of foods consumed since transfer of *Salmonella* among family members may have easily occurred in many instances.

Special emphasis was placed on a search for some single consistently mentioned brand name of a nationally distributed food or food product. None was found frequently enough to implicate it as the presumed common vehicle.

Table 6. Secondary episodes of gastrointestinal disease in 65 families

| | Total | Families or persons ill | |
|---|-------|-------------------------|---------|
| | | Number | Percent |
| Exposed: | | | |
| Families..... | 65 | 27 | 42 |
| Family members..... | 252 | 145 | 18 |
| Positive for <i>Salmonella</i> reading: | | | |
| Children..... | 22 | 5 | 23 |
| Adults..... | 15 | 2 | 13 |

¹ Median age 16 years.

Table 7. Results of stool cultures of family contacts of patients with salmonellosis due to *Salmonella* reading

| Group cultured | Cultures | | |
|------------------------------------|----------|--------------------------------|---------|
| | Total | Positive for <i>S. reading</i> | |
| | | Number | Percent |
| Families..... | 33 | ¹ 18 | 55 |
| Children..... | 64 | ² 22 | 34 |
| Mothers..... | 33 | 12 | 36 |
| Fathers..... | 33 | 3 | 9 |
| Patients ill with gastroenteritis: | | | |
| Children..... | 15 | 5 | 33 |
| Adults..... | 11 | 2 | 18 |

¹ 2 or more family members positive for *S. reading* in 8 families, or 24 percent of total families.

² Median age, 5 years.

Table 8. Frequency of consumption of food in families of patients with *Salmonella* reading infection

| Food item | Total families questioned | History of food consumption | |
|-----------------------------------|---------------------------|-----------------------------|---------|
| | | Number | Percent |
| Mayonnaise or salad dressing..... | 60 | 60 | 10 |
| Chicken..... | 68 | 67 | 9 |
| Peanut butter..... | 40 | 39 | 9 |
| Ice cream..... | 69 | 67 | 9 |
| Cheese ² | 69 | 62 | 9 |
| Cottage cheese..... | 69 | 46 | 6 |
| Gelatin dessert..... | 69 | 61 | 8 |
| Oleomargarine..... | 60 | 50 | 8 |
| Uncooked dried fruit..... | 60 | 38 | 6 |
| Toothpaste A..... | 69 | 36 | 5 |
| Toothpaste B..... | 69 | 19 | 2 |
| Frozen meat pies..... | 68 | 33 | 4 |
| Infant formula or foods..... | 60 | 21 | 3 |
| Precooked frozen dinners..... | 58 | 6 | 1 |

¹ Multiple brand names mentioned for all items.

² Other than cottage cheese.

Many different brand names were mentioned for the most frequently reported foods listed in table 8. Foods previously implicated in extensive outbreaks of salmonellosis, such as canned meats (2) or dried eggs (3, 4), were not commonly used in these families. Frozen meat items requiring only warming before use were also infrequently encountered. The possibility remains, of course, that the crucial food item may not have been included among those on the food questionnaire.

Families were also questioned about the presence of pets in the home. Only 8 families of the 69 questioned owned either a cat, a dog, or a parakeet.

In view of these negative findings, an alternative hypothesis was employed which suggested that some common additive to a frequently mentioned food might be the sought-after common vehicle of infection. This possibility was investigated by means of a study of ice cream which had been mentioned by 97 percent of the families interviewed. A careful enumeration of the ingredients used in several of the ice cream brands consumed failed to reveal any single nationally distributed common additive. Other commonly used foods, such as mayonnaise or salad dressing and peanut butter

(table 8), were disqualified as potential *Salmonella* vehicles because of the failure of these organisms to survive in such media (5, 6). Chicken was consumed by 99 percent of families questioned. However, it was not apparent how birds from many different sources, including small home-fed flocks, could all be infected with a similar, previously rare *Salmonella* type.

In view of the large number of children affected, special attention was given to foods which might be common to this age group. Despite several specific questions included in the food questionnaire, no common brand name baby food, vitamin preparation, or formula mixture was encountered.

Discussion

As an estimate of the magnitude of the problem, data on the number of isolations of *S. reading* in previous years were provided by Dr. Philip R. Edwards, who reported that, during the 8-year period from 1948 through January 1956, only 24 cultures of *S. reading* were identified among approximately 18,000 cultures received. In contrast, 125 isolates representing individual cases were identified at the Communicable Disease Center as *S. reading* during the 16-month period from May 1956 through early September 1957. Of particular interest was the apparent concentration of cases in this country, with few cases reported elsewhere. Inquiries to *Salmonella* typing centers in Canada, England, Northern France, West Germany, and the Netherlands failed to reveal any recent marked increase of *S. reading* isolations in these areas corresponding in time with the peak of cases in this country. However, in 1952 the Netherlands had experienced a sharp rise in *S. reading* cases from an average of 2 to 4 per year to 51 isolations that year. No explanation of this sudden increase and equally sharp decline was available.

Isolations From Animals

As a further attempt at solution of the problem, additional instances of recent *S. reading* isolations, other than from humans, were looked for. State veterinary public health officers were contacted by Dr. James H. Steele, chief, Veteri-

Data on the incidence of *Salmonella reading* isolations in their respective countries were provided by: Dr. E. T. Bynoe, Laboratory of Hygiene, Department of National Health and Welfare, Ottawa, Canada; Dr. Joan Taylor, *Salmonella* Reference Laboratory, Central Public Health Laboratory, Colindale, London, England; Dr. R. Buttiaux, Institut Pasteur de Lille, Centre d'Enseignement et Recherches de Bactériologie Alimentaire, Lille, France; Dr. H. P. R. Seeliger, *Salmonella-Zentrale*, Hygiene-Institut der Universität Bonn, Bonn, Germany; Dr. A. Clarenburg, Rijks Instituut Voor de Volksgezondheid, Utrecht, Netherlands.

nary Public Health Section, Communicable Disease Center, and 9 recent poultry outbreaks of clinically evident salmonellosis due to *S. reading* were reported. The chart shows the few July and August 1956 poultry isolations which preceded the sharp rise in human cases. Since the virulence of *Salmonella* types varies considerably in chicks (7), the organism may be carried with minimum symptoms, and *S. reading* might have been extensively distributed among poultry despite the few reported isolations. Galton and associates (8) have demonstrated the frequency with which salmonellae may be detected in poultry processing plants. If fowl were contaminated with salmonellae, then some nationwide means of infecting poultry would have to be postulated. Feeds might serve this function particularly since a constituent of many poultry feeds is frequently contaminated with *Salmonella*.

Fishmeal imported into West Germany, where much of it is used in animal feeds, was frequently found to be contaminated with *Salmonella* according to Rohde and Bischoff (9) and Adam (10). Furthermore, the isolation of the new serotype *Salmonella blockley* from fishmeal in 1955 occurred almost simultaneously with the occurrence of the first human cases of *S. blockley* infection (11, 12). A relationship between the two through the medium of infected animals was inferred. During 1957, according to a personal communication from Dr. H. P. R. Seeliger, *S. reading* was isolated in West Germany from imported fishmeal and was also found to be the etiologic

agent in several outbreaks of food poisoning. Other investigators have had varying degrees of success in isolating salmonellae from fishmeal. Walker (13) found no positives among 10 samples cultured while Cook, Hobbs, and McCoy recovered salmonellae from 14 of 54 samples studied. Their unpublished report is cited by Walker (13). Rohde and Bischoff (9) found salmonellae in 43 of 270 samples, while Adam (10) reported 16 percent of 833 fishmeal specimens positive for the organism.

In the United States fishmeal is used extensively in a variety of poultry feeds. Of 16 specimens of domestic fishmeal examined bacteriologically by one of the authors (Boring), salmonellae were found in 9 instances. *S. reading* was not among the types isolated, but these specimens were collected during July and August of 1957, well after the peak of the "outbreak." If poultry flocks may in fact become infected with *Salmonella* from contaminated feeds, a potentially major public health problem exists. Thal and co-workers (14) and Seeliger (12) have discussed the probability of infection of domestic animals with *Salmonella* from such contaminated feeds. The danger of human infections from contaminated flocks has been discussed by Abelseth and Robertson (15), Edwards (16), and others.

Clinical and Laboratory Material

Among the 300 or 400 reported acute cases of salmonellosis due to *S. reading*, two deaths occurred in children. A 10-year-old Negro boy died 5 days after onset of symptoms, following a rapidly downhill course. Stool and blood cultures were positive for *S. reading*. The final diagnosis included congenital heart disease, acute and subacute bacterial endocarditis with *Salmonella* sepsis, and sickle cell anemia. His hemoglobin level was reported as 6.2 gm./100 ml. An infant death was reported with no other information available. The only localized *Salmonella* infection reported occurred in a 2-year-old white boy who developed septic arthritis of the calcaneotibial joint. No attempt is made to calculate a case fatality rate in this epidemic for want of a reasonably accurate denominator.

Salmonellosis due to *S. reading* appears to present clinical features similar to those de-

scribed for previous series of patients with *Salmonella* infections (17, 18). However, complications were not present in the study group, although they were reported among patients for whom only incomplete histories were available. The rarity of complications reflects the relatively low virulence and non-invasiveness of *S. reading*. Furthermore, previous reviews referred to dealt only with hospitalized patients, while in the present series half of the patients were not hospitalized. As noted previously, a majority of these patients came from families with above average incomes so that nutrition, sanitation, and medical care approached the optimal level. Eisenberg and associates (18), reporting on a series of 95 patients with salmonellosis seen at the Philadelphia General Hospital noted localized infections in 13 percent of their patients. Many patients in that series were from a lower socioeconomic group, which further sets them apart from the present series of patients. Among 100 infants and children with salmonellosis reported by Clyde (19) from Nashville, Tenn., localization occurred in 9 percent. By comparison with these reports, the 69 patients with *S. reading* infection reported had a relatively mild illness. Nevertheless, 53 percent of the patients voiced the subjective impression that their illness was severe.

Several factors serve to indicate that the "epidemic" of *S. reading* infections was a family affair with a common source of infection in the family. Of the 252 family members exposed in the homes of index cases, 30 percent were either positive for *S. reading* by stool culture or had suffered from gastroenteritis. Even more striking was the finding that in 42 percent of families, at least one secondary illness had occurred. Also, in 55 percent of the 33 families cultured (table 7), at least one contact was found to be positive for *S. reading*. In 55 percent of the 65 exposed families, at least one person was bacteriologically positive or had developed gastroenteritis.

As shown in table 7, mothers were more frequently positive for *S. reading* than were fathers. The significance of this finding is not entirely clear. The mother might be infected or reinfected from her children, who are physically closer to her than they might be to

the father. However, the mother would also be the first member of a family to come in contact with an infected foodstuff. If she prepared this item for cooking, perhaps as with poultry, she might infect herself and other family members by handling salad, the bread plate, the baby's formula, or a host of other items. Necessarily, this is only conjecture.

Two infants aged 2 weeks and one infant 1 week old developed diarrhea, which was later proved to be due to *S. reading*. The mother of one infant had been ill with gastroenteritis prior to delivery, while the mothers of the two other infants were positive for *S. reading* sometime later. As has been demonstrated previously (20, 21), these mothers may have infected their newborn infants during parturition. Since asymptomatic carriers of *S. reading* appeared to be common among family contacts (table 6), inadvertent infection of the more susceptible infants and young children may have occurred frequently.

Among the younger patients in this series, a problem was apparent because of the unusually long duration of the convalescent carrier state. Where a series of cultures negative for *Salmonella* was required before hospital discharge, hospitalization was often unduly prolonged. The difficulty and expense of keeping an asymptomatic child hospitalized usually resulted in discharge due to desperation before the required number of negative cultures were obtained. Realistically, greater emphasis should be placed on the child's clinical course in determining the need for hospitalization than on the duration of stool cultures positive for *Salmonella*. Rubinstein and associates (22) have noted the long duration of carrier states with various *Salmonella* types. In a followup study of an outbreak of *S. oranienburg* in a nursery for the newborn Rindge has also noted the long duration of the carrier state in infants (personal communication). Among infants in families without other *S. oranienburg* positive members, the mean duration of the carrier state was about 7 months. Szanton (23) reporting the 40-month followups on this same series of 33 infected infants found, for the total group, that the carrier state persisted for an average of about 14 months. The futility of applying standard "three negative stool" requirements to

young children hospitalized with salmonellosis is emphasized by these findings. Perhaps parents of these children might be instructed in the necessary home precautions so that, when the clinical condition permits, a child could be discharged from the hospital. Subsequent stool specimens could then be obtained at home.

Summary

More than 300 acute sporadic cases of salmonellosis due to *Salmonella reading*, a previously extremely rare serotype, were reported during a 12-month period. Intensive study of food histories from patients in various parts of the country failed to reveal the presumed common source responsible for this "outbreak." A possible but unknown relationship between infected animal feeds and poultry to the present *S. reading* problem is discussed.

Detailed clinical and laboratory data are presented for 69 salmonellosis patients. The absence of complications in this group is noted and discussed. Among 252 exposed family members, 30 percent had either been ill or were found positive for *S. reading* by stool culture. In 55 percent of 65 families studied at least one member had gastroenteritis or was positive for *S. reading*.

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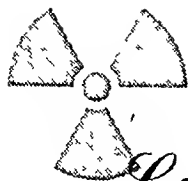
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Bertha Adkins Named Under Secretary

Bertha Sheppard Adkins was named Under Secretary of Health, Education, and Welfare on July 21, 1958, succeeding John Alanson Perkins who resigned. She had been assistant chairman and head of the women's division of the Republican National Committee since 1953.

From 1934 to 1942 Miss Adkins held the post of dean of women at Western Maryland College and during the following 4 years served as dean of residence at Bradford Junior College in Massachusetts. On graduation from Wellesley College in 1928, Miss Adkins taught in private schools until 1932. She holds a master of arts degree from Columbia University conferred in 1943 and is a life member of Pi Lambda Theta, an honorary society for women in education.



Control of

Radioactive Liquid Wastes

in Pennsylvania

KARL M. MASON, M.P.H.



On September 12, 1957, the Sanitary Water Board of the Pennsylvania Department of Health authorized issuance of a permit to the Duquesne Light Company for the treatment and discharge of liquid wastes from the company's steam turbine power plant employing heat exchanged from a nuclear reactor, at Shippingport. Located on the Ohio River some 25 miles from Pittsburgh, this power reactor is the first such installation in this country with disposition of its waste materials regulated by a State health agency.

When, in early 1954, it became certain that the first commercial power reactor was to be constructed in Pennsylvania, the State department of health and its water pollution control agency, the Sanitary Water Board, looked to their responsibilities. Despite the indecision at the time concerning the jurisdictions of the

Atomic Energy Commission and State agencies, the State health department elected to apply its authority under its general health powers to the adoption of radiation protection regulations. In addition, the Sanitary Water Board classified radioactive liquid wastes as industrial wastes, thus requiring a permit for discharge of any such wastes to the waters of the Commonwealth.

With the assistance of the Radiological Health Branch of the Public Health Service, the technical staff of the bureau of environmental health developed the conditions under which these liquid wastes could be discharged. As a result of the cooperation and competence of officials of the Duquesne Light Company and Westinghouse Electric Corporation, early agreement was reached on the radioactivity limits deemed necessary for the protection of the public health. The company, in its application report, had adhered to the maximum permissible concentrations recommended in Handbooks 52 and 61 of the Bureau of Stand-

Mr. Mason is the director of the bureau of environmental health, Pennsylvania Department of Health.

ards and the requirements of the health department's Radiation Protection Regulation. However, as indicated by the permit accompanying this article (p. 898), in the interest of public health protection, more stringent requirements were incorporated into this document than are recommended by national authorities.

The Reactor and Its Wastes

The Shippingport atomic power station is designed to produce electric energy by a conventional turbine-generator unit. The first reactor core has a rating of 231 megawatts heat, producing a 60-megawatt net electrical output. Subsequent cores will have ratings up to 340 megawatts heat and 100 megawatts gross electrical output. Steam for the turbine is supplied by the primary plant, consisting of the nuclear reactor and its associated systems. This plant is comparable to the furnace and boiler of a conventional power station.

The pressurized water reactor consists of a closed system in which water at high pressure is circulated over an array of nuclear fuel elements (the core) to heat exchangers where steam is formed in a separate, isolated system. The active portion of the nuclear core is a cylinder about 6 feet in diameter and 6 feet high containing highly enriched uranium assemblies (called seed) and natural uranium assemblies (called blanket). The seed assemblies contain a total of 75 kilograms of enriched uranium-235, and the blanket contains 14 tons of natural uranium metal in the form of UO_2 .

The radioactive wastes are classified into eight categories: reactor plant effluents, service building wastes, fuel canal water wastes, spent ion-exchange resin and incinerator ash wastes, combustible solid wastes, noncombustible solid wastes, gaseous wastes, and boiler water. The three main sources of radioactivity which contribute to the liquid wastes are:

1. The activation of corrodible metals, corrosion products, and trace elements in the high-purity reactor coolant water.
2. Fission products released from failed fuel elements.
3. Tritium resulting from activation of the lithium hydroxide added to the reactor coolant water to minimize corrosion in the system.

It is estimated by the company in its report that only about 2.5 percent of the total radioactivity will be discharged to the river. Most of the remainder will be retained in the spent ion-exchange resin storage tanks (97.4 percent); a minute percentage will be discharged as gas to the atmosphere (0.01 percent).

In order to insure that the required degree of treatment is provided, the liquid wastes are sampled and the level of radioactivity determined at each stage of the treatment process. During a long period of retention in underground storage tanks the radioactivity is reduced appreciably by decay, and subsequent processing through the ion-exchangers reduces further the radioactivity of these wastes. Thus, the entire treatment is a series of batch processes prior to discharge to the river, and the wastes may be reprocessed if the samples indicate that the required reduction in radioactivity has not been accomplished. The high-level radioactive wastes which are retained in the ion-exchanger are held for disposition by burial elsewhere at locations supervised by the Atomic Energy Commission.

Safety Factors

The accepted standard applied to the discharge of liquid wastes to streams utilized for public water supplies is that the radioactivity for unknown mixed fission products shall not exceed an annual average of 1×10^{-8} microcuries per milliliter above natural background radioactivity at the next point of use downstream. To provide extra protection for the waters traversing Pennsylvania and to retain a portion of the stream flows for the discharges from future nuclear facilities, several safety factors were added to this standard.

As an example, the sampling point for Shippingport wastes is in the plant's effluent channel containing the condenser cooling water. This location results in an extra safety factor of more than 100 since the maximum amount of condenser cooling water is less than 1/100 of the mean flow of the Ohio River. Another appreciable factor of safety is that the limits of radioactivity apply at any time, rather than to the average concentration over an interval

of 1 year. These same conservative requirements have been incorporated in the permits issued to six other nuclear facilities of various types and will be applied to several applications now under consideration.

In considering the application of the Duquesne Light Company, one of the initial counterproposals of the Pennsylvania Department of Health was that the company reduce substantially its request for an emergency discharge of 700 curies of tritium in 1 day should an accident occur in any of the coolant loops. Although this amount of tritium was below the maximum permitted by accepted standards for an average concentration over an entire year, the company agreed to withdraw this proposal and limit the maximum discharge of tritium during any 1 day to less than 1 percent of the maximum allowable concentration. This agreement is consistent with the objective of the department of health and its Sanitary Water Board to produce and discharge the least amount of radioactivity practicable. Recent analyses of waste discharges from the Shippingport plant indicate that it will be possible to conform to the stringent standards for fission products as well as for tritium.

During 1956 and 1957 the Westinghouse Electric Corporation conducted, under the sponsorship of the Atomic Energy Commission, a site-monitoring program in the vicinity of the Shippingport plant. The purposes of the preoperational phase of this program were to determine the types and amounts of radioactive materials which occur in the environment around the reactor plant and to determine the variations in the amounts of these materials over a period of approximately $1\frac{1}{2}$ years prior to operation. Analyses were made on (a) soil in the general vicinity of the plant, (b) Ohio River water above and below the site, (c) well water within a 1-mile radius, (d) vegetation in this general area, and (e) the air in the general area.

Although the department of health accepted the reports of Westinghouse's study and assisted in some of the sampling, it decided to initiate further studies in the area in order to encompass all phases of the environment sub-

ject to possible contamination by radioactivity. Through the efforts of the department's public health veterinarian, specimens of animal life and milk products have been collected and analyzed for radiation levels, both in the general area of the plant and in a control area. Using Federal program grant funds, the department has contracted with the University of Pittsburgh to determine the radioactivity levels of all types of aquatic life in the Ohio River above and below the plant site. Since both the department of health and the Duquesne Light Company are continuing the site-monitoring programs on a postoperational basis, data will be available on all of the environmental aspects which could be affected by nuclear facilities in this area.

Summary

Public health authorities in Pennsylvania are administering a program of radioactive liquid waste control in the following manner:

1. Radioactive liquid wastes have been classified as industrial wastes and thus are subject to a permit from the Sanitary Water Board.
2. Since the treatment processes employed at such installations have not been subject to full-scale operation experience, the permits are granted on an experimental basis.
3. For the purpose of insuring protection of the public health and the retention of stream volumes for future discharges, the levels of radioactivity in liquid wastes must conform to more stringent standards than those generally accepted.
4. The conditions of the permit, including the maximum allowable concentrations, are subject to revision if altered conditions or the advance of science and technology so indicate.
5. The discharge of radioactivity shall be kept at the most practicable minimum, regardless of maximum amounts permissible.
6. Adequate analyses and operational reports must be submitted to the department of health.
7. Environmental monitoring programs shall be continued and, if necessary, expanded.
8. Immediate notification of the department is required in the event of accident or discharge in excess of tolerance.

COMMONWEALTH OF PENNSYLVANIA

DEPARTMENT OF HEALTH

SANITARY WATER BOARD

HARRISBURG

INDUSTRIAL WASTES PERMIT NO. 1832

The Sanitary Water Board, which by virtue of the Act of April 9, 1929, P. L. 177, known as The Administrative Code of 1929, and the amendments thereto, and of the Act of June 22, 1937, P. L. 1987, as amended by the Act of May 8, 1945, P. L. 435, is empowered to exercise certain powers and perform certain duties "To preserve and improve the purity of the waters of the Commonwealth for the protection of public health, animal and aquatic life, and for industrial consumption, and recreation; . . .", hereby issues this permit to the Duquesne Light Company, 435 Sixth Avenue, Pittsburgh 19, Pennsylvania, its successors or assigns, approving, subject to certain conditions, the proposed works for the treatment of wastes from the permittee's atomic (nuclear reactor-steam turbine) power plant located in Shippingport, Beaver County, Pennsylvania, with discharge of the treated effluent therefrom into a channel of the Ohio River between its left, or southern, bank and Phillis Island, about 11 miles below the confluence of the Beaver River, in response to an application, undated but attested June 19, 1957.

This plant is designed for the production of 60 megawatts, i. e., 60,000 kilowatts of electrical energy during initial operation. Later, possibly after about a year, and when the present core has been replaced by a more powerful one, the plant is expected to reach a maximum rating up

to 340 megawatts of heat and 100 megawatts gross electrical output.

This application requests approval of "the discharge to the Ohio River of an average of 12,000 gallons per day of waste water containing approximately 10 curies of tritium and 1,590 microcuries of other radioactive materials. This effluent consists, for the most part, of laundry and shower room wastes and neutralized laboratory wastes which are released to the condenser effluent stream at a controlled rate. The lesser portion of the discharge consists of reactor plant wastes. The system consists of gravity collection tanks; intermediate storage and decay tanks; processing by evaporator, ion-exchangers, gas stripper; followed by controlled discharge to the river. Radioactivity is measured at each stage of the process and before discharge." It is to be noted that the term "neutralization," as used above, refers only to chemical neutralization.

The proposed plant and waste treatment works will provide for batch treatment of all wastes. If in the opinion of the Sanitary Water Board, any wastes are inadequately treated, facilities will be available for recycling such wastes through all or parts of the treatment process until the effluent is satisfactory for discharge to the waters of the Commonwealth when diluted with the normal volume of cooling water. The proposed works are described in

some detail in an engineering report entitled "Duquesne Light Company—Shippingport Atomic Power Station—Shippingport Borough—Beaver County, Penna.—April 20, 1957" and are shown on twelve sketches and diagrams bound with the report and entitled and described as follows:

Artist's Conception of the Shippingport Atomic Power Station.

Figure 1. Duquesne Light Company—Territory Served and Location of Principal Facilities—December 31, 1955—No. SP-507.

Figure 2. Shippingport Power Station—Duquesne Light Company—Plan Showing General Arrangement.

Figure 3. (This is an isometric drawing, diagrammatic, showing the reactor and four main coolant loops.)

Figure 4. PWR Reactor Vessel.

Figure 5. (These are enlarged detail sketches of reactor core, seed and blanket assembly, fuel rods, etc.)

Figure 6. Seed Assembly Cross Section.

Figure 7. PWR Fuel Rod Exploded View.

Figure 8. Reactor and Steam Plant—Plan View.

Figure 9. Radioactive Waste Disposal System—Plot Plan.

Figure 10. Radioactive Waste Disposal System (flow sheet).

Figure 11. Shippingport Power Station—Area Survey Stations. . .

Also bound with the company's report are two tables, "Table I—Expected Maximum Steady-State

Activity For Non-Volatile Fission Products in the PWR Wastes—Duquesne Light Company—Shippingport Atomic Power Station” and “Table II—Activity Discharged to River—Waste Disposal System—Duquesne Light Company—Shippingport Atomic Power Station.”

The report and plans were prepared by J. A. Tash, Eng., Power Stations Dept. of the Duquesne Light Company. The report is signed by W. J. Lyman, a professional engineer, Pennsylvania Registry No. 5582, Vice-President, Operations Division, Duquesne Light Company, and stamped as received in the Pennsylvania Department of Health, Division of Sanitary Engineering, Region III, on June 21, 1957.

These plans are hereby approved subject, nevertheless, to the condition that the waste treatment plant to be constructed under said plans will produce an effluent satisfactory to the Sanitary Water Board. By this approval, neither the Board nor the Commonwealth of Pennsylvania assumes any responsibility for the feasibility of the plans or the efficiency of the operation of the plant to be constructed thereunder.

This permit is issued subject to the following Special Conditions:

A. The waste treatment facilities shall be constructed and ready for operation coincident with the start of power operation of the reactor.

B. Approval of plans refers to waste treatment and not structural stability, which is assumed to be sound and in accordance with good structural design. Failure, because of faulty structural design or poor construction, of the works herein approved will render this permit void.

C. Since the herein approved works employ principles not at present considered conventional, they must be regarded as *experimental* and the subsequent action of the Sanitary Water Board will depend on actual performance in eliminating the objectionable characteristics of the waste waters as discharged from the works in question.

D. The discharge of untreated or improperly treated industrial wastes to the waters of the Commonwealth

is contrary to the requirements of the Sanitary Water Board. If, because of accidental breakdown of the treatment works or plant equipment or for any other reason, any such discharge should occur, then the operation of any process producing such discharge shall be discontinued until repairs to the treatment works or other satisfactory measures to prevent stream pollution shall have been completed.

E. The permittee is hereby directed to immediately notify the Pennsylvania Department of Health whenever there is a spill or an accidental discharge of radioactive material and shall advise that Department promptly concerning the pertinent facts and probable danger. The permittee shall maintain rosters of Pennsylvania Department of Health personnel and of downstream users of river water who shall be notified. The necessary information for such rosters shall be furnished to the permittee by the Department of Health. In the event of any such accidental discharge, the Department of Health shall determine whether or not downstream users shall be notified, and by whom.

Moreover, the permittee is required to see to the training and supervision of all operating personnel, in order to prevent the discharge of such material, fluid or solid, to the waters of the Commonwealth or to the site, without adequate treatment.

F. All industrial wastes discharged to the portion of the Ohio River on which the permittee's plant is located shall meet at least the requirements of the Sanitary Water Board for primary treatment. “Primary treatment” does not apply to the radioactive characteristics of the wastes.

The term “primary treatment,” as here used, is such treatment of sewage as, in the opinion of the Board, will remove practically all of the settleable solids; will remove at least 35 percent of the organic pollution load as measured by the biochemical oxygen demand test; will accomplish the removal of oils, greases, acids, alkalis, toxic, putrescible, taste- and odor-producing

substances, and other substances inimical to the public interest in the receiving stream; will provide effective disinfection to control disease-producing germs; will provide for satisfactory disposal of sludge; and will produce a final effluent that is suitable for discharge into the receiving stream. “Primary treatment of industrial wastes,” as here used, is treatment to a degree equivalent to that set forth herein for sewage.

Moreover, because of the radioisotopes which these wastes may carry, such wastes shall be substantially free of turbidity and suspended solids over and above the amounts of such characteristics in the intake water.

G. The treated radioactive liquid wastes as discharged to the Ohio River shall comply with the Pennsylvania Department of Health Radiation Protection Regulation 433 and any subsequent regulations of the Department of Health.

H. With respect to the amount of radioactivity released in the liquid wastes to the waters of the Commonwealth, this permit is issued subject to the following conditions: (1) that the average radioactivity, exclusive of tritium activity, of these wastes over any consecutive 365-day period shall not exceed 1,500 microcuries per day, with the maximum discharge not exceeding 6,200 microcuries per day, (2) these wastes shall at no time carry more radioactivity, exclusive of tritium activity, than 10^{-8} microcuries per milliliter in excess of that of the plant intake water from the Ohio River, and (3) that the discharge of tritium in these wastes shall be not more than 10 curies per day averaged over any consecutive 365-day period, nor more than 50 curies per day maximum. Moreover, the company shall conduct all its pressurized water reactor operations so as to produce and discharge the least practicable amounts of radioactivity.

I. Although tritium has a short biological half-life (19 days) and a maximum permissible concentration (MPC) of 0.2 microcuries per ml. (according to Handbook 52 of the National Bureau of Standards) as compared with an MPC of 10^{-8} micro-

curies per milliliter for the general population for unidentified isotopes, its radiological half-life is long enough (4,600 days) to make its continued presence in the stream undesirable and possibly inimical to aquatic and other life. At the present time, it is reported, there are no practical means for its separation from a liquid. The permittee, however, shall continue to investigate and apply more effective means to remove this potential hazard as rapidly as such means are developed, or attempt to devise some other means or to attempt to find some other substance which will have advantages similar to that of lithium hydroxide without producing the present discharge of tritium. The attention of the permittee is directed to the possibility that tritium may prove objectionable as a constituent of water used for certain industrial processes.

J. The radioactive and other liquid wastes discharged to the effluent channel shall be well admixed with the cooling water so that the waste content of this channel shall be substantially uniform below the effluent weir or at the sampling rake.

K. The treated effluent shall be discharged to the river in a manner acceptable to the Sanitary Water Board. If any structure is necessary to accomplish this, it shall be well protected against the effects of flood waters, ice, and other hazards and the design of such structure shall be acceptable to the Sanitary Water Board.

L. Provision shall be made for regulating the discharge of the treated effluent so that it shall be equally distributed over the longest practicable period, in order that advantage may be taken of maximum possible dilution by the receiving stream, and means to accomplish uniform 24-hour distribution shall be provided if in the opinion of the Department of Health this shall be found necessary.

M. The wastes after treatment and prior to discharge to the effluent channel shall contain no more than 0.05 p.p.m. of hexavalent chromium and 1.0 p.p.m. of trivalent chromium.

N. The permittee shall provide means for measuring the total volume as well as variations in the rate of discharge of all waste water. Equipment to automatically record this information shall be provided promptly if directed by the Department of Health.

O. Any solid waste material including radioactive material shall be so handled that a nuisance is not created, and shall be disposed of in a safe and sanitary manner to the satisfaction of the Department of Health and in accordance with the provisions of the Pennsylvania Department of Health Radiation Protection Regulation 433 and any subsequent regulations of the Pennsylvania Department of Health.

P. It is required that a sampling schedule be maintained and that records thereof be kept together with records of the operation of the waste disposal system, and that such data be submitted in reports to the Department of Health, covering such particular matters and at such intervals as the Department may direct, beginning within two months after the initial operation of the plant. It is noted that the report submitted with the present application indicates that records will include:

1. Accumulation rate and activity for each class of waste by days.

2. Changes in activity of wastes during processing.

3. Volume and activity of waste discharged.

4. Time of day and duration of discharge with volume and activity automatically recorded.

The special nature of the wastes produced at the permittee's Shippingport plant may cause the Sanitary Water Board to require additional sampling, analysis, and testing of the surface and underground waters in the vicinity, particularly of the Ohio River at points above and below the plant, in order to determine the effects of radioactivity on these waters.

The report submitted to the Board by the permittee, in support of its permit application, indicates that such sampling is being conducted at present by or under the sponsorship

of the U. S. Atomic Energy Commission. If for any reason, however, the AEC does not continue this sampling, or if in the opinion of the Sanitary Water Board additional data are needed, the permittee may be required to conduct such sampling and analysis as the Board may direct.

Q. Acknowledgment is made of the company's study now in progress to determine temperatures and percentage of river volume that flows through a narrow river channel between Phillis Island and the mainland to determine the expected rise in river water temperature in this channel when the condenser cooling water is discharged to it. The permittee is hereby advised that the river water temperature rise is tentatively limited to 2° F. at points to be determined by the Sanitary Water Board after the results of the thermal studies of the channel and of other data have been reviewed, and that if this limit cannot be maintained with the proposed method of discharge, then complete dispersal of the condenser effluent in the river, or other means for temperature control, may be necessary. The report on the river channel study shall be submitted in duplicate to the Sanitary Water Board within 60 days of completion of the study which is expected to terminate in the last months of 1958, with progress reports on a quarterly basis.

R. The permittee shall submit to the Sanitary Water Board a comprehensive report on the operation of the herein approved treatment works within six weeks after completion of the first half-year of operation, and within a similar period of time subsequent to any substantial change in the operating capacity of the plant or any other marked change in operation or waste treatment. The report shall include pertinent information as to waste volumes, radioactivity before and after waste treatment, the general adequacy of these works in treating all waste discharges from this establishment so as to meet the requirements of the Sanitary Water Board for primary treatment, an overall estimate of the success achieved in (1) the

reduction of the pollution carried to the stream and (2) in the continuous maintenance of a final liquid effluent meeting the requirements of the Board as to uniform admixture with the cooling water.

S. If the effluent as produced by the waste treatment works herein approved shall in the opinion of the Sanitary Water Board prove to be of quality unsatisfactory for discharge into the receiving stream, by reason of the creation of a public nuisance, or because of change in the character or volume of the wastes, or in the use or condition of the receiving stream, or for other reason; or because in the Board's opinion such discharge is or may become inimical or injurious to the public health or to animal or aquatic life or to the use of the receiving body of water for domestic or industrial consumption or for recreation, then a higher degree of treatment (by means of additional plant units or otherwise) shall

be provided. Plans for additional works shall be prepared promptly after notice from the Board so to do, and after approval of the plans by the Board, the additional treatment shall be provided and placed in operation within such time as the Board shall require. No construction shall be undertaken without such approval.

T. This permit will be subject to review from time to time by the Sanitary Water Board, and to change if so indicated by altered conditions or the advance of science and technology.

And this permit is further subject to the following numbered Standard Conditions of "Standard Conditions Relating to Industrial Wastes" effective January 1, 1941, attached hereto: 1, 2, 3, 6, 7, 13, 16, and 17.

[NOTE: These standard conditions require adherence to prior permits or orders, compliance with the approved construction plans and with

the established effluent standards, adequate supervision during construction, notification of the department of health when construction is completed, proper maintenance of treatment facilities, and permission from Federal authorities for the installation of stream structures.—EDITOR]

This permit is issued in response to an application (No. 12234-IW) filed in the Harrisburg office of the Pennsylvania Department of Health on the 22d day of June A. D. 1957, and in accordance with the authorization given by the Sanitary Water Board at its meeting on September 12, 1957.

SANITARY WATER BOARD
By: BERWYN F. MATTISON, M.D.,
Secretary of Health, Chairman
Attest: JOHN W. GITTINS,
Secretary

HARRISBURG, PENNSYLVANIA,
November 1, 1957

Tuberculosis Casefinding in Schools

The Public Health Service, the Office of Education, and the Children's Bureau have suggested that school and college officials and health departments assess existing tuberculosis casefinding programs among students and employees in the light of the recent official statement of the Public Health Service on X-ray Casefinding Programs in Tuberculosis Control, published in *Public Health Reports*, January 1958.

The Committee on Health of the School Age Child, a joint body of the three agencies of the Department of Health, Education, and Welfare, has made these recommendations:

1. Tuberculosis casefinding programs for children, youth, teachers, and other school personnel should be evaluated and planned in the light of current knowledge concerning the prevalence of tuberculosis and the effects of radiation on the human organism. Profes-

sional assistance and advice should be sought from the appropriate State or local health department.

2. Laws and regulations that make periodic chest X-ray examinations compulsory for students, teachers, and other school personnel should be reviewed and modified if necessary to allow health authorities to select the most effective current methods and to utilize applicable new knowledge and techniques of tuberculosis control.

3. Consideration should be given to the use of the tuberculin test as the initial screening device to be followed by a chest X-ray of reactors. The percentage of reactors in some school and teacher populations is low enough to make this a practical procedure.

4. X-ray equipment should be periodically checked and adequate safeguards applied to protect all persons from unnecessary radiation.

Nursing Care for Hemiplegic Patients

Nursing care of hemiplegic patients, the victims of stroke, occupied the 1958 seminar in cardiovascular nursing conducted by the Heart Association of Southeastern Pennsylvania in Philadelphia last February.

The proceedings published by the association consist of papers describing the nature, needs, and management of the condition.

More than a million Americans suffer hemiplegia, said Dr. William J. Erdman II of the University of Pennsylvania School of Medicine. Attacks, resulting from a block of the brain's blood supply, occur at any age. Effects may include a loss of consciousness; flaccid paralysis, usually up to a few days; spasticity in the flaccid area; inability to communicate, although hearing and understanding may be unimpaired; inability to judge what is vertical; loss of the sense of touch; and a painful shoulder.

Dr. Erdman recommended an optimistic attitude, which can be communicated to the patient by explaining the prospect for recovery; accepting the patient's limitations without criticism; drawing favorable attention to each sign of recovery; encouraging patients to do as much for themselves as they are able, without posing tasks so formidable as to discourage them; and encouraging hobbies or employment for the homebound. Although progress is slow, he said, 4 out of 5 patients regain ability to take care of personal needs.

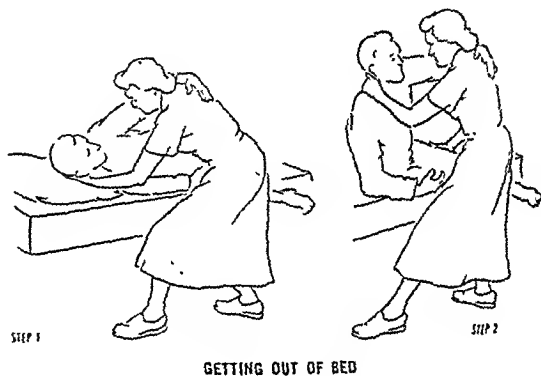
Vera Ford Powell of the Albert Einstein Medical Center's home care program offered specific advice to nurses. The attitudes of the family and the patient must be understood if therapy is to be effective, she said. "The patient is frightened, anxious, and angry. There is never consistency in the cooperation of a patient. The family develops attitudes of pity, hostility, and rejection. Too much help is not good for the patient."

For the nursing of an aphasic (speechless) patient, she advised a relaxed attitude; a calm, friendly, and secure atmosphere; acceptance of the patient's inability to talk; and acceptance

of the tendency of the patient to resort occasionally to infantile language or to vile outbursts. She warned nurses not to anticipate what the patient is trying to say, not to say it before the patient has expressed it in full. Recovery, she emphasized, proceeds from tactfully but persistently encouraging the patient to say basic words and perform essential movements in all activities of the day.

Occupational therapists, physical therapists, and others participated in the meeting, which included discussions of self-help devices for the partially paralyzed.

✓ Strike Back at Stroke



A major obstacle in management of stroke patients has been a problem of communication between physician and the patient's family. The above illustration is typical of those used, with appropriate legends, in a new Public Health Service publication, *Strike Back at Stroke*, to explain how to move and exercise stroke victims. The book contains 21 therapeutic exercises and is arranged so that the physician can prescribe for the patient's specific needs.

Demands for this publication have been such that the first edition was sold out before it was announced in *Public Health Reports* in August. Health departments are distributing copies to physicians.

To prepare the illustrations in this book, approximately 250 photographs were taken of the more typical procedures used in treating hemiplegic patients. Drawings were made from the photographs selected by a group of consultants who assisted in the development of the book.

Developing an Ordinance and Code for Food Vending Machines

WILLIAM C. MILLER, Jr., M.S.

THE AUTOMATIC merchandising of food has grown from the penny candy vendor to prototype machines which dispense an entire hot meal at the touch of a button. A billion dollars for foods and beverages was dropped into coin slots in 1957, and vending machines are now supplementing snack bars and cafeterias in many factories and offices.

With the rapid expansion of this type of food buying, many States and communities and the trade organization of the industry requested the Public Health Service to develop a model sanitation ordinance and code for vending machines. Culminating 4 years of study and investigation, the recommended ordinance on the vending of foods and beverages was published in July 1957 (1). This suggested legislation is not solely a product of the Public Health Service. It also represents the views of State and local health officials and the vending machine industry.

The development of model ordinances and codes for nationwide use is not an easy task. Such a document aims to meet every situation in every State and community. The definitive provisions must reconcile the strict public health point of view, which may not recognize some of the operating problems, and the strict industry

point of view, which may not recognize some of the public health considerations. Accordingly, a model or suggested ordinance represents a series of compromises which afford maximum public health protection and yet can be attained in practice.

History and Growth

The history of automatic merchandising starts about 200 B. C.; the first vending machine of record dispensed holy water in a Greek temple in Alexandria, Egypt. In the early part of the 19th century, bulk tobacco was automatically merchandised in English pubs. Vending machines first appeared in the United States in the late 1880's. Penny gum and chocolate bars were dispensed in packages and salted peanuts and ball gum in bulk. Although cigars appeared in vending machines around the turn of this century, not until the mid-1920's were cigarettes so merchandised. Prior to World War II most vending machine operations were in the penny sales category (2).

During the past few decades, the vending industry has undergone phenomenal growth and technical change. Few facts and figures are available that accurately indicate the magnitude of the industry prior to 1950. However, personal observation and limited information indicate that food and beverage vending machine operations in the 1930's and early 1940's were primarily small businesses, with individuals owning and operating only a few machines.

Demands for infant feeding during World War II increased the number of vending ma-

Mr. Miller is chief of the Food Sanitation Section, Milk and Food Program, Division of Sanitary Engineering Services, Bureau of State Services, Public Health Service. This article is based upon a paper presented at the annual meeting of the South Carolina Association of Sanitarians, Inc., at Myrtle Beach, S. C., May 23, 1958.

chines which assisted in meeting the needs for on-the-job refreshment. Subsequently, the automatic merchandising of foods and beverages in factories, office buildings, institutions, and other locations began to supplement and, in some instances, to replace the small cafeteria or snack bar.

The estimated total sales of products through vending machines in 1947 approximated a half billion dollars. In 1957, total sales exceeded \$2 billion, about half of which were foods and beverages. The automatic vending of foods and beverages accounts for a large part of the increases during the past few years. For example, about 2,000 coffee vending machines were in use in 1949, with sales of about \$1.5 million. In 1957, the sales of 70,000 machines dispensing coffee and other hot beverages were more than \$135 million, an increase of 35-fold in machines and 90-fold in dollar sales. Similarly, sales of milk and milk products increased more than four times between 1953 and 1957. Sandwich and pastry sales have tripled since 1953 (2).

Until the last few years, most foods and beverages dispensed through vending machines were not readily perishable. However, as the industry expanded, the variety of products dispensed began to include many readily perishable products, such as hot and cold sandwiches, meat dishes, soups, and salads. Currently there are prototype machines which hold precooked frozen meals and dispense these meals hot in a matter of seconds. The expansion has introduced new products in food merchandising and public health protection normally not encountered in conventional food service businesses.

Requests for a Code

The earliest activities of the Public Health Service in connection with the vending of foods and beverages date back to the late 1940's. The changing character of automatic merchandising prompted a number of States and communities to request the Service to furnish opinions on the public health hazards of certain types of vending machines. Opinions delivered were based on the sanitation standards in the existing restaurant and milk ordinances and codes.

As the vending of perishable foods expanded, many States and communities requested the

Service, in the interest of uniformity, to develop specific criteria which could be recommended for the sanitary control of foods merchandised in this manner. The National Automatic Merchandising Association, a trade organization representing the equipment manufacturers, the operators, and the suppliers, also requested the Service to formulate a model vending machine sanitation ordinance and code.

This work began in 1954. The Milk and Food Program of the Division of Sanitary Engineering Services made field studies of current practices in vending machine design, construction, and operation. The problems encountered were discussed in detail with individual State and local health authorities, representatives of the vending industry, and others concerned. Conferences were held with groups and individuals who had or were engaged in research related to vending machines.

Next, existing ordinances and regulations specifically concerned with the sanitary control of vending machines were reviewed. In 1954, only six local health departments reported that they had adopted such regulations; however, many indicated they felt there was a need for sanitary control of food and beverage vending. The most comprehensive standards reviewed at that time were those developed for the Armed Forces by the Subcommittee on Food Supply, Committee on Sanitary Engineering and Environment, National Research Council. The industry representatives indicated that the general criteria established in these standards were practical for all types of vending operations, although the standards were limited to coin-operated, bulk-type vending machines which dispensed beverages or liquid foods.

The first working draft of the ordinance was completed in 1955 and was discussed with members of the industry. In April 1956, the second working draft was submitted for review and comment to all States, a representative number of communities, several Federal agencies, the vending machine industry, and interested groups and persons. More than 800 groups and individuals had the opportunity to review and comment on the second draft, and their comments proved invaluable in preparing *The Vending of Foods and Beverages* for publication.

Basic Assumptions

The ordinance and code is based upon several major assumptions. The first is that it will be adopted only by jurisdictions having established food sanitation programs. Accordingly, the criteria of existing programs are the basis for the acceptability of foods, beverages, and ingredients; acceptability of the commissaries providing the foods, beverages, ingredients, supplies, and equipment; and acceptability of cleaning methods and bactericidal treatment of the surfaces of the machine in contact with the product. Second, ordinance provisions should be directed primarily toward the protection of readily perishable foods, but should cover public health considerations of vending machines dispensing all types of products.

And third, vending machines are unique; generally they are unattended food dispensing devices and must be self-contained units with the necessary built-in controls for protection of foods or beverages. In reference to this, it is recognized that the health authority, as well as industry, may find it desirable to cover automats, or attended vending machines, under the existing regulations for food service establishments. If this procedure is followed, such businesses should conform fully to the requirements for food service establishments.

The format of the ordinance has been designed to permit flexibility in methods of enactment or adoption. It includes a short enabling form for use by those jurisdictions where adoption by reference is legal. Use of this form reduces cost of publication and printing and facilitates keeping the ordinance up to date. To be adopted only as an ordinance, the code material concerning satisfactory compliance under section V should be deleted. The unabridged version has been arranged and presented in a form that can be adopted as an ordinance and code. When the unabridged form is adopted, section IX, enforcement interpretation, should be deleted.

Briefly, these are the major provisions of the ordinance.

Section I defines the terms used in interpretation and enforcement. This is an essential section of any regulation because specificity of intent must be delineated both for those administering the ordinance and for those regulated

by it. Such terms as "vending machine," "commissary," "machine location," "readily perishable food," "operator," "employee," and "health authority" are defined.

A surprising difficulty was encountered in trying to define "readily perishable foods." Most of those concerned with food sanitation have a pretty firm idea of what is meant by "readily perishable foods." But try to write a definition that is clear, concise, and definitive! To find one, the counsel of representatives of the Food and Drug Administration, the offices of the Surgeons General of the Army, Navy, and Air Force, the National Institutes of Health, universities, and State and local health departments was sought. The definition in section I reflects the combined thinking of a group of people primarily concerned with food protection.

Permits

Permit requirements are normally a part of most food sanitation laws or regulations and from a public health point of view are a registration device to give the health authority a measure of the magnitude of operations requiring program coverage. Section II of the ordinance establishes for permits requirements governing application, issuance, suspension, revocation, and reinstatement.

It soon became obvious in developing permit requirements that they could become an administrative monstrosity to the health authority and the operator. A large number of operators or a single operation of any size would make it almost impossible for the health authority to maintain a current list of all machine locations. Therefore, the operator is required to maintain such information and to make it available to the health authority of the jurisdiction upon request. Permits are not required for each machine but are issued to each operator. The operator's permit number, of a size and style approved by the health authority, should be conspicuously displayed on each vending machine so that in a public health emergency involving a given machine, the health authority can readily identify and contact the responsible operator.

In applying for an operator's permit, the applicant must advise the health authority of the

products to be dispensed, and whether the products will be dispensed in bulk or packages. To keep his permit, the operator must also notify the health authority of any change in types of vending machines or conversion of existing machines to dispense products other than those for which the permit was first issued. Permits, of course, are nontransferable.

Section III prohibits the sale of misbranded or adulterated foods or beverages, and provides for the examination and condemnation of such products.

The inspection of vending machines and commissaries is covered in section IV. Vending machines dispensing readily perishable foods or beverages and all commissaries should be inspected at least once every 6 months. Machines dispensing other than readily perishable products, for example, peanuts, popcorn, and carbonated beverages, should be inspected as frequently as the health authority deems necessary and practical. In addition to authorizing and requiring inspections, this section requires the operator to provide the health authority with access, either in the company of an employee or otherwise, to the interior of all vending machines he operates.

The health authority is required to notify the operator of unsatisfactory findings of an inspection and to establish a specific, reasonable period of time for correction. When conditions are grossly insanitary, or a substantial hazard to the public health exists, the health authority can, with due process, require the immediate discontinuance of operation.

Sanitation Requirements

The sanitation requirements for vending machines and their operation are set forth in section V. Obviously these requirements must be based on the type of food or beverage dispensed. For example, the vending of prepackaged chewing gum hardly presents a danger to the public health, but the vending of milk, sandwiches, salads, and a variety of other readily perishable foods can be potentially hazardous. This section is concerned primarily with the vending of perishable foods and beverages; however it also includes general provisions which are applicable to all vending

machines. An effort was made to cover by specific requirements particular foods or types of vending operations which present a potential health hazard.

Section V is quite detailed and is presented in eight parts. Part A concerns the protection and wholesomeness of foods, beverages, and ingredients, at their sources and in the vending machine, and the protection and maintenance of surfaces of containers and equipment in contact with the product. It requires that readily perishable foods within the vending machine be held at a temperature not higher than 50° F. or not lower than 150° F., whichever is applicable.

Controls are required to insure the maintenance of these temperatures at all times, provided that an exception may be made for the actual time required to fill or otherwise service the machine, and for a recovery period of 30 minutes following the filling or servicing operation. These controls are required to be such that, in the event the temperature in the food storage compartment rises above 50° F. or falls below 150° F., the machine is placed in an inoperative condition until serviced by the operator. The food storage compartment of vending machines dispensing readily perishable foods must have a thermometer with an accuracy of $\pm 2^\circ$ F.

Two points about the temperature controls should be emphasized. First, the 30-minute bypass of the machine cutout is not required but is permitted because of a practical operating problem. The possible public health hazard is calculated to be relatively small. Second, if at the end of this 30-minute period and at any time thereafter, the temperature of the food storage compartment fails to meet required standards, the dispensing mechanism must become inoperative pending the operator's reservice of the machine. Thus, unless the readily perishable products put into the machine at servicing meet temperature requirements, the machine is likely to become inoperative after not more than 30 minutes.

Milk and fluid milk products offered for sale through vending machines must be dispensed only in individual, original containers or from bulk containers filled at the milk plant. This requirement is excepted when the fluid milk

product is an ingredient in liquid foods or beverages dispensed at 150° F., such as in a coffee machine. In this circumstance, the milk product may be transferred at the machine location from the original container of not more than one-half gallon capacity to the vending machine bulk container which is clean and which has been subjected to approved bactericidal treatment. In such a transfer, the entire contents of the original container must be used.

This exception is a necessary compromise, since dairy-filled containers for fluid milk products, suitable for vending machine use, were not available at the time the ordinance was developed. It is understood that several equipment manufacturers are working on this problem with promise of success.

The cleaning, filling, and protection of containers used in bulk milk vending machines are consistent with the provisions for bulk milk dispensers as set forth in the milk and restaurant ordinances recommended by the Public Health Service.

All parts of vending machines in contact with readily perishable products are required to be cleaned and bactericidally treated daily, unless these parts are kept at all times at a temperature not higher than 50° F. or not lower than 150° F. The frequency for cleaning the contact surfaces and parts of other types of vending machines, such as carbonated beverage or popcorn machines, is established by the health authority. The operator should maintain within machines of this type a date record of cleaning and bactericidal treatment. Protection of single service containers used in vending machines dispensing foods or beverages in bulk is also specified.

Other Requirements

Part B requires that the machine's location have a minimum potential for contaminating the product and that the location be easily cleanable and kept clean. Part C, exterior construction and maintenance, specifies that machines be sturdily constructed and that exteriors be designed, fabricated, and finished to facilitate cleaning and minimize the entrance of vermin. Screens for ventilation louvers are required; however, because of the large number of ma-

chines currently in use which are not screened, the requirement is deferred for these machines until they are relocated or removed from present locations for any other purpose.

Part D, covering interior construction and maintenance, provides that all interior surfaces and component parts of vending machines be so designed and constructed as to permit easy cleaning and being kept clean. It further requires that all surfaces in contact with the product be smooth, nontoxic, corrosion resistant, and be made of relatively nonabsorbent material. Such surfaces must be protected from contamination and be capable of withstanding routine cleaning and bactericidal treatment.

Inplace cleaning of pipes and tubing of all machines dispensing other than readily perishable foods is permitted. This practice is acceptable if pipes and pipe fittings are so arranged that cleaning and bactericidal solutions can be circulated throughout the system, these solutions contact all interior surfaces, the system be self-draining or otherwise completely emptied, and the procedures result in thorough cleaning. The vending stage of all bulk food or beverage machines must have a tight-fitting, self-closing door or cover that remains closed except when food or beverage is delivered.

Part E provides that water used in vending machines be from an approved source and be of a safe, sanitary quality. Water used as an ingredient of the product must be piped into the machine under pressure, with connections and fittings installed in accordance with local and State plumbing regulations.

While the water supply provisions of this ordinance were being developed, information was received concerning several outbreaks of illness attributed to copper poisoning from post-mix carbonated beverage machines. In almost every instance, investigation revealed that there had been a breakdown of the check valve in the water supply line upstream from the carbonator. Specific provisions were therefore developed to protect against such occurrences.

Post-mix carbonated beverage machines are required to have two check valves or a double one; or an air gap; or a device to vent carbon dioxide to the atmosphere; or other device

approved by the health authority which will prevent carbon dioxide or carbonated water from entering the water supply system. All contact surfaces downstream from the protective device are required to be of such material as to preclude the production of toxic substances which might result from interaction with carbon dioxide or carbonated water. If check valves are used, a screen of not less than 100 mesh to the inch must be installed in the supply line immediately upstream from the valves. This screen is to remove any particulate matter which might lodge between the valve and its seat and which might be of sufficient size to nullify the valve's purpose.

Part F, waste disposal, states that all trash and other wastes must be removed from the machine location as frequently as necessary to prevent nuisance and unsightliness and must be disposed of in an approved manner. Machines dispensing liquid products in bulk should have containers to collect drip, spillage, overflow, or other liquid wastes. An automatic shutoff is required which will place the machine out of operation before the liquid waste container overflows.

Part G requires that foods, beverages, and ingredients, and the surfaces of containers, equipment, and supplies in contact with the product be protected from contamination while in transit to machine locations. Further, readily perishable foods while in transit must be maintained at a temperature not higher than 50° F. or not lower than 150° F. This provision does not necessarily require a refrigerated or heated truck, but does require maintenance of these foods at appropriate temperatures. A well-insulated container might suffice, depending on the distance and size of the operation.

That employees have clean hands and wear clean outer garments while handling foods, beverages, and surfaces in contact with products are not only standard requirements in food ordinances but are good business practices as well. This provision is in part H.

Sections VI and VII provide for communicable disease control related to vending machines, and for necessary action when disease is suspected.

Some automatic merchandising businesses are both intrastate and interstate operations.

Section VIII provides for reciprocal inspection of commissaries and permits the health authority to accept reports from the responsible health authorities in other jurisdictions where commissaries may be located.

Enforcement interpretation, penalty provisions, repeal and date of effect, and the unconstitutionality clause, all standard provisions, are set forth in sections IX, X, XI, and XII, respectively.

Industry Efforts

It would be remiss to fail to recognize the industry's part in the promotion of vending machine sanitation. Only a few small outbreaks of illness attributed to foods or beverages from vending machines have been reported to the National Office of Vital Statistics. However, the rapidly changing technology in this type of food service has substantially increased the potential for foodborne outbreaks. This potential was recognized early by a number of forward-looking members of the vending machine industry. Led by the Public Health Committee of the National Automatic Merchandising Association, vending machine manufacturers and operators assisted in the development of the ordinance and code and have endorsed its provisions. In addition, many of the new vending machines are already being designed and fabricated with greater attention to sanitation, and an aggressive public health program has been initiated by and for the industry.

Adoptions

California and Indiana are using the recommended ordinance and code as the basis for State laws or regulations. Many of its provisions are being incorporated into New York City's sanitary code, which is currently under revision. It is also serving as the basis of vending machine sanitation requirements being prepared by the District of Columbia and the city-county of Denver.

Total implementation of the vending machine ordinance and code, whether at State or local levels, ultimately depends upon the development of genuine cooperation, personal as well as official, between sanitarians and vending

machine operators. In the interest of effective vending machine sanitation, it is suggested that health officials get to know the operators in their jurisdictions. By making some rounds with local operators, sanitarians can become acquainted with machine operations and servicing and learn the public health and operational problems associated with various machines. The result will be a sharing of "know how" and an interchange of ideas and experiences. This sort of cooperation pays big dividends in the area in which we all work—the

protection of the health of Americans everywhere.

REFERENCES

- (1) U. S. Public Health Service: The vending of foods and beverages; a sanitation ordinance and code; 1937 recommendations of the Public Health Service. PHS Pub. No. 546. Washington, D. C., U. S. Government Printing Office, 1957.
- (2) National Automatic Merchandising Association: Annual directory of automatic merchandising. Chicago, 1954-57.

technique

Nutrition Quiz

A nutrition quiz for dental hygienists of the New York City Department of Health was held April 26, 1957, at the Fort Green Health Center in Brooklyn. The idea for this quiz originated with the borough consultant in dentistry for Brooklyn, who was looking for a stimulating and novel training activity.

Nutrition has always been an integral part of the Brooklyn dental hygienists' inservice training. Customarily, nutrition consultants and supervising dentists from the New York City Department of Health plan group meetings, often held during school vacations, and hold conferences with individual hygienists on specific problems during this inservice training.

Representatives from the hygienists' group, the borough consultants in dentistry and nutrition, the supervising dentist, and three district nutritionists attended a planning session for the quiz. It was decided

that the hygienists would volunteer to study specific nutrients such as vitamins, protein, and minerals as well as calories. Each hygienist was expected to study her topic and to become a "specialist" in answering questions concerning it. The hygienists also agreed to submit questions on their chosen topics.

These questions were then edited and revised by the dentists and nutritionists. The questions were geared to personal nutrition needs as well as those the hygienists met in the field.

For the quiz, all of the 50 hygienists attending were divided into two teams, each with a captain. Each team had its own specialists who had studied their respective nutrients. The consultant in dentistry acted as quiz master, hygienists as team captains and timekeepers, and nutritionists as scorekeepers.

Typical questions were: Define a vitamin. Give five symptoms of a vitamin C deficiency. Name five results of insufficient dietary protein. Is it true or false that fruit is low in calories?

Questions were put first to non-specialists who earned a score of 2

for a correct reply within 30 seconds. A question unanswered within this time limit was turned over to a specialist, whose reply was worth one point. The nutritionists, as they kept score, made notes of challenged answers, points needing explanation, and questions which no one answered correctly. Fifty-five questions were posed during the hour-and-three-quarter morning session.

The nutritionists used the luncheon following the quiz to dramatize the subject of nutrition. Each platter of food on the buffet table bore a sign identifying its nutritional value.

The participants' interest remained high for the afternoon session when the nutritionists took up debated and unanswered questions. Using teaching devices such as bar graphs and posters, they explained points brought up during the quiz, stimulating further discussion.

The day's activities culminated with the announcement of the quiz prize winners. Prizes provided by the nutritionists for each member of the winning team were oranges, grapefruit, carrots, spinach, escarole, chicory, green celery, apples, and cans of dry, nonfat milk solids.

—HILDA KREIGENHOFER, *borough consultant in nutrition, bureau of nutrition, New York City Department of Health.*

Machines that vend carbonated beverages have occasionally been the source of copper poisoning. Poisoning can be prevented if contact between copper lines and carbonated water is precluded.

Copper Poisoning From Vending Machines

SAMUEL H. HOPPER, Ph.D., and HAROLD S. ADAMS, B.S.

SEVERAL health departments have reported cases of illness that appear to be copper poisoning associated with carbonated drinks obtained from vending machines. These machines, the post-mix type, release 1 ounce of a flavored syrup into a cup and then add 5 or more ounces of carbonated water.

In the reported instances of alleged poisoning, the individuals who became ill developed symptoms generally described as acute gastric upset about 12 hours after the vending machine had been in use. The cases of poisoning seemed to occur only after a faulty check valve allowed carbon dioxide to flow into a copper waterline connecting the machine to the building's water supply. Where there is a faulty check valve, the carbon dioxide usually flows back into the water supply because the gas pressure in the tank is greater than the pressure in the building's waterline.

Our investigation at the University of Indiana was conducted to determine whether copper poisoning could result from a carbonated beverage dispensed from a post-mix machine that uses a copper waterline.

Review of Copper Poisoning Cases

Case 1. Twelve persons became ill in a manufacturing plant at Kokomo, Ind., on February 13, 1952. Detailed accounts of sickness were obtained from five persons. There was extensive corrosion of the copper cylinder in a water filter. The carbon in the filter con-

tained 0.43 mg. copper per gram, which is equivalent to 430 ppm.

Case 2. Information from the Office of the Surgeon General, Department of the Army, indicates that defective check valve on a machine at Fort Hamilton, N. Y., in January 1957, resulted in carbonation in the copper waterline. Three persons became ill and laboratory analysis showed 35 ppm copper in the water. Reports of carbonation in a waterline, with no reference to any illness, were also made for First Army Headquarters and a naval receiving station in New York.

Case 3. F. A. Korff of the Baltimore City Health Department reported in a personal communication that a 4-year-old boy was admitted to Union Hospital in Baltimore, Md., on April 3, 1957, with a complaint of vomiting, which started immediately after drinking a carbonated beverage from a vending machine. The child was sufficiently improved to be discharged from the hospital the next day. The laboratory report of his gastric washings showed copper salts, and the attending physician attributed the illness to poisoning from copper salts.

Case 4. J. H. Fritz of the Kansas City (Mo.) Health Department investigated illness of a 2-year-old girl which occurred on February 18,

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1957, near the city. The child became ill and vomited 15 minutes after drinking part of a carbonated beverage. The remainder of the beverage was taken by the child's grandfather to the city health department. Since the alleged poisoning occurred beyond the jurisdiction of the city health department, the laboratory of the Federal Food and Drug Administration was asked to analyze the sample. The laboratory found approximately 35 ppm copper. Investigation showed that a rubber check valve leaked and allowed carbonated water to lie in a copper waterline overnight. The first few drinks vended the following morning caused illness in eight persons, but only one sample of the beverage was available for analysis. Maintenance men from the company owning the machine replaced a faulty check valve before the Kansas City (Mo.) Health Department personnel arrived on the scene.

Case 5. The Los Angeles Health Department reported that two persons experienced nausea and vomiting within 15 minutes after drinking a carbonated beverage from a vending machine. Investigators found that a defective carbonator valve permitted carbon dioxide to back up into a copper waterline. Chemical analysis of the water from the carbonator indicated 260 ppm of copper (1).

Correspondence with the Los Angeles Health Department revealed that the check valve in question had a single ball held in place by a spring. A small particle which appeared to be a piece of a gasket had lodged under the ball preventing it from closing. A drink drawn from the machine contained 110 ppm copper, while water taken directly from the carbonator contained 260 ppm copper.

Toxicity of Copper

There is no single source of information on copper's toxicity. Information must be gathered from the official publications of a large group of professional agencies. Excerpts from some of these leave the impression that an exact figure for toxicity of copper in man cannot be given.

The Dispensary of the United States of America (2) states that "copper is a constit-

ent of all tissues of the animal organism; it is absorbed in the intestinal tract from food, which supplies about 2 mgm. daily." It is stored in the liver, and blood contains about 0.14 mg. per 100 ml., or 1.4 ppm. The possible deleterious effect of continued ingestion of considerable quantities of copper has been debated. Copper is not toxic in the same sense that lead, mercury, and nickel are toxic. Many of the soluble salts of copper when taken in a large quantity may give rise to gastroenteritis. The phrase "large quantity" is not defined. Vomiting is usually so prompt that systemic poisoning does not occur.

Davenport (3) in an excellent review states that "there seems to have been, and still is for that matter, no unanimity of opinion regarding the toxicity of copper." She quotes from an editorial (4) on copper which said: "The danger from copper waterlines is slight. Copper is readily attacked by the various acids present in foods such as acetic, citric, malic, tartaric, and oleic. Consequently, any food or drink containing acid will dissolve a certain amount of copper if it comes in contact with that metal. There is no doubt that the human organism can take care of minute amounts of copper, but where the dividing line is between the harmless and the harmful amount cannot yet be said. Individual susceptibility probably enters in to complicate the problem. The danger from copper and brass pipes is negligible. Although copper cooking utensils might possibly be dangerous especially when used for fruits, the real risk comes from industrial hazards and from moonshine liquor."

Gleason and his co-workers state that in general the soluble ionized salts of copper are much more toxic than the insoluble or slightly dissociated compounds (5). The subacetate and the chloride forms are the most poisonous, with cuprous chloride being twice as toxic as the more common cupric salt. They go on to point out that no major toxicological distinctions are recognized between these two valences of copper. Only cupric copper was measured in our series of experiments.

Methods and Results

A post-mix type of machine was obtained on consignment to simulate field conditions for the

study (4). The other materials consisted of $\frac{3}{8}$ -inch copper tubing cut in 6-foot lengths, some valves, and a cylinder of carbon dioxide.

A 6-foot piece of copper tubing was filled with 100 ml. of carbonated water from the machine, which was connected to the building's water supply. One end of the tube was closed with a valve and the other end was connected to a cylinder of CO₂ under 75 pounds pressure. Tests were repeated 16 times for copper in tap water under pressure. Each ranged from 1 to 4 days in duration. The results varied from 0 to 10 ppm. All tests for copper were made by R. B. Forney, department of toxicology, Indiana University Medical Center, according to the diethyldithiocarbamate method (6).

Since the copper tubing was new, the inside of one tube was etched to see if it would, in this condition, release more copper. The tube was treated with 10 percent nitric acid for 20 minutes and then rinsed thoroughly. Carbonated water was used; the results were not different from those described above.

When an orange drink was used in two separate 24-hour tests, 4.4 and 7.6 ppm copper was obtained from each. At this point all results were regarded as essentially negative.

Table 1. Effect of 75 pounds of carbon dioxide static pressure on water or flavored drink in a copper tube

| Number of trials | Contents of tube ¹ | Length of test (days) | Copper (ppm) |
|------------------|--|-----------------------|--------------|
| 16 | Tap water..... | 1-4 | 0-10 |
| 1 | Tap water ² | 1 | 0-10 |
| 1 | Orange drink ³ (noncarbonated)..... | 1 | 4.4 |
| 1 | Orange drink (noncarbonated)..... | 1 | 7.5 |
| 1 | Orange drink (noncarbonated)..... | 1 | 5.0 |
| 1 | Cola drink (carbonated)..... | 1 | 13.0 |
| 1 | Cola drink (carbonated)..... | 4 | 25.0 |
| 3 | Orange drink (carbonated)..... | 1-4 | 20-50 |
| 1 | Orange drink (carbonated)..... | 4 | 200.0 |

¹ In all cases, the valve at one end of the copper tube was closed. The other end was connected to a cylinder of carbon dioxide.

² The tube was treated with 10 percent nitric acid for 20 minutes before using.

³ The term "noncarbonated" means that the water for the drink did not pass through the carbonator in the machine.

The syrup lines are not connected to the waterline in post-mix machines. Hence a vended drink cannot back up into the waterline in the event of a check valve's failure. Despite this, an orange drink and a cola drink, made with 1 ounce of syrup and 5 ounces of carbonated water, were each kept in a copper tube for 24 hours under 75 pounds CO₂ pressure. The laboratory of the Indiana State Board of Health analyzed these samples in order to check on the previous work and reported that the orange drink contained 5.0 ppm copper and the cola drink 13 ppm copper, which approximated the amount we had obtained. Water under similar conditions showed 6.0 ppm copper.

For the next experiment a cola drink was put into the tube and held under 75 pounds CO₂ pressure for 4 days. The pH was 4.0 when the drink was removed, and it contained 25 ppm copper. An orange drink treated similarly had a pH of 3.5 and 200 ppm copper. Drinks not treated with CO₂ had a pH of 2.0 and less than 1 ppm copper. Carbonated water held for 4 days under 75 pounds pressure at pH 5.2 had 2 ppm copper. Repeated attempts ranging from 1-4 days with the orange drink gave copper in amounts of 20 to 50 ppm. As the summary in table 1 indicates copper was found in the acid drink that was allowed to stand in the tube. But the cause, we reason, could be due to either the acidity or to the type of drink. As a result, buffers were made to check on the effect of acidity.

Buffers were prepared according to Clark's method (7). Their pH varied from 2.6 to 5.0. Potassium acid phthalate and hydrochloric acid up to pH 3.6 were used in the preparation; the phthalate with sodium hydroxide added was used for pH 4.0 to 5.0. The tube was filled with buffer at pH 3.35 and kept at room temperature for 24 hours. No CO₂ was used. When the buffer was removed, its pH was 3.90 and it contained 200 ppm copper. A repeat experiment showed 166 ppm copper. In the next trial CO₂ was bubbled through carbonated water at pH 5.6 for 18 hours. The result was 3.5 ppm copper. However, when the pH was reduced to 5.0 and CO₂ was bubbled through the water for only 2 hours, the result was 25 ppm copper.

We thought that the amount of copper dissolved might be dependent upon whether the tube was new or old. A new tube was filled with buffer at pH 3.60 and was allowed to stand at room temperature for 21 hours. When the buffer was removed, its pH was 3.90 and it contained 600 ppm copper. For an old copper tube, we used the tube which had been etched with nitric acid some months previously and which had been used repeatedly. Buffer at pH 4.75 was put into this tube and kept at room temperature for 20 hours. When the buffer was removed, its pH was 4.80 and it contained 500 ppm copper. Thus, the age of the tube seemed to have no effect.

Table 2. Effect of pH on copper tube

| Buffer (pH) | Time (hours) | Copper (ppm) |
|----------------|--------------|------------------|
| 3.35----- | 24 | ¹ 200 |
| 3.50-3.90----- | 24 | ¹ 166 |
| 5.6----- | 18 | ² 3.5 |
| 3.60----- | 21 | ² 600 |
| 5.0----- | 2 | ² 25 |
| 4.75----- | 20 | ² 500 |
| 4.0----- | 2 | ² 400 |

¹ No CO₂ was used.

² CO₂ allowed to bubble through the tube.

It appeared at this point that copper would dissolve if CO₂ were bubbled through the water at a high enough rate to reduce the pH below 5.0. This reduction was easily accomplished. Carbon dioxide was bubbled through the water until the pH was 4.0 and the amount of copper was 400 ppm (see table 2).

At a pH below 5.0 using a phthalate buffer, large amounts of copper were dissolved. Tap water in a copper tube with CO₂ bubbling through it gave similar results. Thus, it was obvious that copper dissolves as the acidity increases. This lowering of pH occurs when CO₂ bubbles continuously through a copper tube containing water, and is similar to what happens when a faulty check valve is under CO₂ pressure higher than the water pressure.

The explanation for the phenomena reported remains obscure. In all probability the copper which is dissolved is not directly related to the pH, since a very strong acid is needed to

dissolve copper. It would seem that the solubility of copper is dependent upon the presence of dissolved oxygen as well as carbon dioxide. There is ample dissolved oxygen in tap water to form an oxide of copper, which, in the presence of carbonic acid, gives enough copper ions to combine with naturally occurring sulfates and carbonates to appear in the vended drink. A faulty check valve permits carbon dioxide to bubble through the tube and allows enough circulation of water to supply the oxygen needed for the first step in the process.

Public Health Aspects

At the outset, it should be understood that copper poisoning does not represent a public health problem of any great magnitude, since the relatively few cases on record compared with the millions of soft drinks consumed would give an infinitesimally small case rate. To minimize copper poisoning, however, we suggest:

1. Vending machines should adhere to the sanitation code concerning the use of two check valves or a double check valve; or an air gap; or a device to vent the CO₂ to the atmosphere; or a device approved by the health authority (8).
2. A carbonator should not be made of copper. It should be made of an acid resistant nontoxic metal.
3. Water filters and water conditioning devices should not use a copper container.

Summary

If the check valves in a post-mix type vending machine do not function correctly, carbon dioxide may enter the water supply line. In the event that this line is made of copper, then (a) the CO₂ or carbonated water will react with the copper; (b) under certain conditions, the quantities of copper going into solution could be quite large; and (c) copper poisoning could occur from a beverage dispensed from a post-mix type, carbonated beverage machine.

Support is thus given to recommendations that these machines be designed and constructed so as to preclude contact between copper and CO₂ or carbonated water, and such machines be

study (4). The other materials consisted of 3/8-inch copper tubing cut in 6-foot lengths, some valves, and a cylinder of carbon dioxide.

A 6-foot piece of copper tubing was filled with 100 ml. of carbonated water from the machine, which was connected to the building's water supply. One end of the tube was closed with a valve and the other end was connected to a cylinder of CO₂ under 75 pounds pressure. Tests were repeated 16 times for copper in tap water under pressure. Each ranged from 1 to 4 days in duration. The results varied from 0 to 10 ppm. All tests for copper were made by R. B. Forney, department of toxicology, Indiana University Medical Center, according to the diethyldithiocarbamate method (6).

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| 1 | Orange drink ³ (noncarbonated)..... | 1 | 4.4 |
| 1 | Orange drink (noncarbonated)..... | 1 | 7.5 |
| 1 | Orange drink (noncarbonated)..... | 1 | 5.0 |
| 1 | Cola drink (carbonated)..... | 1 | 13.0 |
| 1 | Cola drink (carbonated)..... | 4 | 25.0 |
| 3 | Orange drink (carbonated)..... | 1-4 | 20-50 |
| 1 | Orange drink (carbonated)..... | 4 | 200.0 |

¹ In all cases, the valve at one end of the copper tube was closed. The other end was connected to a cylinder of carbon dioxide.

² The tube was treated with 10 percent nitric acid for 20 minutes before using.

³ The term "noncarbonated" means that the water for the drink did not pass through the carbonator in the machine.

The syrup lines are not connected to the waterline in post-mix machines. Hence a vended drink cannot back up into the waterline in the event of a check valve's failure. Despite this, an orange drink and a cola drink, made with 1 ounce of syrup and 5 ounces of carbonated water, were each kept in a copper tube for 24 hours under 75 pounds CO₂ pressure. The laboratory of the Indiana State Board of Health analyzed these samples in order to check on the previous work and reported that the orange drink contained 5.0 ppm copper and the cola drink 13 ppm copper, which approximated the amount we had obtained. Water under similar conditions showed 6.0 ppm copper.

For the next experiment a cola drink was put into the tube and held under 75 pounds CO₂ pressure for 4 days. The pH was 4.0 when the drink was removed, and it contained 25 ppm copper. An orange drink treated similarly had a pH of 3.5 and 200 ppm copper. Drinks not treated with CO₂ had a pH of 2.0 and less than 1 ppm copper. Carbonated water held for 4 days under 75 pounds pressure at pH 5.2 had 2 ppm copper. Repeated attempts ranging from 1-4 days with the orange drink gave copper in amounts of 20 to 50 ppm. As the summary in table 1 indicates copper was found in the acid drink that was allowed to stand in the tube. But the cause, we reason, could be due to either the acidity or to the type of drink. As a result, buffers were made to check on the effect of acidity.

Buffers were prepared according to Clark's method (7). Their pH varied from 2.6 to 5.0. Potassium acid phthalate and hydrochloric acid up to pH 3.6 were used in the preparation; the phthalate with sodium hydroxide added was used for pH 4.0 to 5.0. The tube was filled with buffer at pH 3.35 and kept at room temperature for 24 hours. No CO₂ was used. When the buffer was removed, its pH was 3.90 and it contained 200 ppm copper. A repeat experiment showed 166 ppm copper. In the next trial CO₂ was bubbled through carbonated water at pH 5.6 for 18 hours. The result was 3.5 ppm copper. However, when the pH was reduced to 5.0 and CO₂ was bubbled through the water for only 2 hours, the result was 25 ppm copper.



Miss Sleeper



Dr. Dearing



Mr. Mason



Dr. Arnold

New Members of the PHR Board of Editors

The Board of Editors of *Public Health Reports* has gained four new members. Appointed to the board for 3 years, they replace outgoing members Dr. Leo W. Simmons, Dr. H. Trendley Dean, Margaret Arnstein, and Vernon G. MacKenzie.

Francis A. Arnold, Jr., D.D.S., became director of the National Institute of Dental Research, Public Health Service, in 1953. He had served as associate director since establishment of the institute in 1943.

Dr. Arnold's entire professional career has been in the Public Health Service, which he entered in 1934 on graduation from the dental school of Western Reserve University. In 1937, he joined the Dental Research Section, National Institutes of Health, of which he became assistant chief in 1943.

A prolific researcher of international eminence in the dental sciences, Dr. Arnold is a fellow of both the American College of Dentists and the American Public Health Association. He is also a member of the American Dental Association and a former president of the International Association for Dental Research and is now vice president of the Fédération Dentaire Internationale.

W. Palmer Dearing, M.D., assistant director for health in the Office of Defense Mobilization, previously served for 9 years as Deputy Surgeon General of the Public Health Service.

After graduation cum laude from Harvard Medical School, Dr. Dearing taught epidemiology in the Harvard School of Public Health. He became a Public Health Service career officer in 1934, serving as an epidemiologist in studies of poliomyelitis and tuberculosis until 1941. That year he was assigned to the Office of Civilian Defense as assistant, and then, chief medical officer. In 1944 he was named personnel chief of the Health Division, United Nations Relief and Rehabilitation Administration, returning to the Public Health Service in 1945 as deputy chief of the Division of Public Health Methods. A year later he became chief of the Division of Commissioned Officers.

Karl M. Mason, M.P.H., was named director of the bureau of environmental health, Pennsylvania Department of Health, in 1954, after having served as the

department's director of professional training since 1951. During 1949 to 1951, he was associated with the Public Health Service following 6 years as director of the division of public health engineering with the Peoria, Ill., Department of Health. Previously, he spent 2 years as public health engineer with two county departments of health in Michigan.

Mr. Mason is a diplomate of the American Academy of Sanitary Engineers and a member of the Advisory Committee to the Surgeon General of the Public Health Service on Water Pollution Control. In addition, he is the Pennsylvania representative on the governing council of the American Public Health Association and a lecturer at both the University of Pittsburgh Graduate School of Public Health and the Robert A. Taft Sanitary Engineering Center in Cincinnati, Ohio.

Ruth Sleeper, R.N., has been director of the School of Nursing and Nursing Service of the Massachusetts General Hospital in Boston since 1946. She began her nursing career in 1922 when she graduated from the Massachusetts General Hospital Training School for Nurses. Miss Sleeper took a master of arts degree from Teachers College, Columbia University, in 1935 and holds the honorary degrees of doctor of humanities from Boston University (1953) and doctor of science from Hood College (1954).

President of the National League of Nursing Education during 1944-48 and of the National League of Nursing in 1952-55, she was also chairman of the Joint Commission for the Improvement of the Care of the Patient.

Her current posts include chairmanship of the Education Committee of the International Council of Nurses and membership on the Expert Committee on Nursing of the World Health Organization and on the Board of Directors of the National League of Nursing.

equipped with a device or devices that provide positive protection against the backflow of CO₂ or carbonated water into the building water supply system.

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National Conference on Air Pollution

Municipal, county, and State health personnel, control officials, and scientists and technicians concerned with atmospheric pollution will meet with community leaders representing a wide variety of civic, industrial, and service organizations and agencies at the National Conference on Air Pollution in Washington, D. C., November 18-20, 1958.

Surgeon General Leroy E. Burney has called this conference, open to anyone interested in the subject, for two principal purposes: to create a wider understanding of air pollution problems among civic leaders, and to outline a practicable plan for future action in both research and control.

The program is designed to encourage maximum participation by all conferees. Following a day of orientation, during which participants will hear a status report from the Surgeon General and brief presentations on current knowledge and accomplishments, the assembly will divide into six discussion groups to formulate recommendations for desirable future activities.

On the morning of the third day, the six groups will present their recommendations to a plenary session. The final afternoon's pro-

gram will resemble a "town meeting," with questions and discussion from the floor.

A steering committee comprising representatives of the American Public Health Association, American Municipal Association, Air Pollution Control Association, and other principal governmental, industrial, and scientific organizations have aided the Surgeon General and his staff in planning the conference.

Chairmen and vice chairmen of the discussion groups, in that order, are as follows:

Extent of air pollution: Dr. Arie J. Haagen-Smit and Dr. H. C. McKee.

Sources of air pollution: S. L. Hanauer and Dr. Leslie Chambers.

Health effects of air pollution: Dr. Malcolm H. Merrill and Dr. James P. Dixon.

Economic and social effects of air pollution: Dr. John T. Middleton and Arthur Crago.

Control methods and procedures for air pollution: Dr. Leslie Silverman and W. C. L. Hemeon.

Administrative aspects of air pollution: Dr. Louis C. McCabe and Harold W. Kennedy.

ing programs in public health education. The sequence of events is best reflected in a review of the years when students in public health education were first enrolled in other schools of public health.

1945—University of Minnesota

1946—North Carolina College

1946—University of California

1948—University of Puerto Rico

1951—Harvard University

1951—Columbia University

All these schools are still training public health educators. Consequently, since 1943 the number of academically trained health education personnel in the United States has increased. In contrast to 1943, when 7 students were enrolled in public health education training, in 1958 the enrollment in schools of public health showed a total of 130 students. In addition to the students currently in training, reports indicate that approximately 1,250 persons have received academic training at the graduate level in public health education from 1943 through 1957. This total includes students in Puerto Rico, but does not include students from foreign countries.

Several additional results are also evident. When the Kellogg funds were expended, other agencies, both voluntary and official, began to support health education training. This trend has continued; 60 percent of the students enrolled in courses of public health education for the school year 1956-57 were sponsored either by official or voluntary agencies.

Schools which now provide training at the doctorate level are the University of California, Harvard University, and the University of North Carolina.

Increasingly for the past 10 years, schools have made their courses available to students from other countries. In many instances special training has been arranged for these students, whose needs differ radically from those of Americans.

Health Leadership

Health leadership both in this country and on the international scene has come from among the candidates who studied under the Kellogg Foundation Fellowships. The positions which

the fellows currently hold reflect the impact of the fellowships that were awarded from the two grants.

For this phase of the report the graduates were asked to submit a summary of their professional activities since the completion of their health education training. The questions were open-ended; consequently, there is not complete uniformity in the responses. Nevertheless, all the data received are included in this summary.

In March 1958, data were obtained on 38 of the 47 candidates. Of the other 9, 1 is deceased, 1 entered a religious convent and no information is available as to whether she worked previously in public health, 4 persons did not respond to the letter of inquiry, and 3 could not be located. Of the 38 candidates who responded to the letter of inquiry, 24 received their training at the University of North Carolina, 7 at the University of Michigan, and 7 at Yale University. Three of them have since taken further graduate work and obtained doctorates of philosophy, and a fourth is currently enrolled in a course leading to the doctorate degree.

Following completion of the training, 37 of the 38 did work as health educators for varying periods of time. Employment in health education ranged from less than 1 to 15 years with a median of 7½ years. The one candidate who did not work in this capacity married immediately following graduation, and although she did work for 6 months on a health project, it was not as a health educator. Currently, 22 of the 38 respondents are employed, 18 in health education positions and 4 in other fields.

Since all fellowships were awarded to women, marriage could be expected to remove a large portion of them from the labor market. Twenty-five have married, and they have usually withdrawn from employment at the time of marriage. However, several have returned to work after varying periods of absence. As a group they have worked in health education from less than 1 to 11¼ years with a median of 3¾ years. Currently 9 are employed: 5 in health education positions, 3 in teaching, and 1 as a laboratory technician.

Several of the respondents indicated they hope to return to active employment when their

History of a Health Education Fellowship Program

IDA BRUGNETTI, M.P.H., and MAYHEW DERRYBERRY, Ph.D.

ACADEMIC TRAINING specifically in public health education prior to 1943 was received by relatively few. In 1943 the two schools offering such training, Yale University and the University of Michigan, had only seven students enrolled.

A demonstration project had been started under the sponsorship of the Public Health Service in 1941 in North Carolina. Its purpose was to demonstrate what a person trained in health education could contribute to the achievement of the goals of a public health program. By 1943, this demonstration led to a proposal to train more such personnel. As a result of a request from the Public Health Service, the W. K. Kellogg Foundation made two grants totaling \$72,000 for the purpose "of increasing the number of qualified public health education personnel in the United States who could carry on the types of health education programs that had been demonstrated as being successful in North Carolina."

The steps developed to accomplish this purpose were:

1. To initiate a program for the training of public health educators in the University of North Carolina.
2. To stimulate and support programs of training then in existence at Yale University and the University of Michigan.
3. To encourage other schools of public health to establish training programs in health education.

This report, prepared 15 years after the initial grant, supplements previous summary reports of the program and describes some of the results.

Miss Brugnetti is a health education consultant assigned to the Illinois State Health Department, and Dr. Derryberry is chief of the Public Health Education Branch, Division of General Health Services, Bureau of State Services, Public Health Service.

To initiate the training of public health educators at the University of North Carolina it was decided to award fellowships directly to qualified individuals for a 1-year graduate course in public health education leading to the degree of master of public health. To be eligible candidates were required to have a baccalaureate degree which included a background in the natural sciences and social sciences. Preference was given those who had shown some degree of effective participation in community undertakings and who displayed skill in and an understanding of human relations.

For the majority of candidates, the fellowships completely financed their training, paying for tuition, field training, travel, and a monthly stipend to the individual. Others were awarded partial fellowships which paid only a portion of their expenses.

Extending the Program

In its second phase, the program was extended to Yale University and the University of Michigan. The two grants provided a total of 47 fellowships, 41 completely financed and 6 partially financed. Of these, 26 went to the University of North Carolina; 11 to the University of Michigan; 10 to Yale University. All the awards were to women, inasmuch as during the war men were not exempted from military or other essential employment to study specialties such as health education.

The program of study initiated in the University of North Carolina, with progressive modifications to meet the changing demands, is still operating. It has continued to develop, offering courses at the doctorate level, and since 1946, has been extended to North Carolina College.

Recruitment, training, and placement of the candidates who had completed specialized study in public health education helped to encourage other schools of public health to establish train-

The New York State Interdepartmental Health Resources Board enables State agencies concerned with physical and mental health to achieve concerted action.

An Interdepartmental Approach to Health

I. JAY BRIGHTMAN, M.D.

SEVERAL UNITS of government are concerned with health and medical care. Departments of health, as well as mental health agencies and hospitals that are organized as separate government units, are primarily responsible. Departments devoted to social welfare, education, correction, and labor (including workmen's compensation) also have as a secondary function a share in health matters.

Very often the health functions of these departments are closely related or identical, the difference being limited to the population groups served by the specific agencies, the nature of the health matters coming under their jurisdictions, and the professional disciplines available to them. Cooperation among the departments and coordination of their efforts are necessary if unbalanced or conflicting approaches are to be avoided and effective programming achieved.

The New York State Interdepartmental Health Resources Board was established by an act of the 1956 State legislature to permit joint planning, coordination, and program development of physical and mental health matters that concern two or more State departments or agencies.

In an editorial comment on the development of the board, Dr. Herman E. Hilleboe, New York State's commissioner of health, stated:

Dr. Brightman is executive director of the New York State Interdepartmental Health Resources Board, Albany, N. Y.

"In an era when it would appear that governmental agencies are ever expanding, it is heartening to note the establishment of the Interdepartmental Health Resources Board which actually replaces two former health units of New York State government. The establishment of this board is a step forward in efficiency and economy in government affairs in the field of human resources" (1).

The replaced health units to which Dr. Hilleboe referred were the Interdepartmental Health Council and the Mental Health Commission. The council, organized in 1947 on a directive from the Governor, included the commissioners of health, education, social welfare, and mental hygiene, and a member of the State legislature. The council met monthly to study problems in public health of interest to the several departments in order to determine the extent to which the State programs were meeting their objectives, and to make recommendations accordingly. It performed a useful service in the exchange of information and ideas on departmental activities in various health fields and in conducting special studies through interdepartmental committees. Since the council was not established by a legislative act as an executive agency, however, it had no official status. It received no funds of its own and could neither employ a full-time staff nor contract with outside agencies for special projects. Its limited staff work was carried out by the executive director of another State agency, the Joint Hospital Survey and Planning Commis-

children mature. Another factor possibly influencing the employment of married women is their place of residence. The women who listed teaching as their current work are residing in small towns where positions in health education may not exist. However, no data are available regarding this point or the preference for teaching school by the graduates.

Of the 13 respondents who are not married, all appear to have worked in health education since their graduation and are still working in a variety of types of agencies and positions. The length of such employment has varied from 9 to 14½ years with a median of 12½ years. The positions these graduates hold are:

Consultants for State boards of health: 3.

Consultants in the International Cooperation Administration, serving ministries of health in other countries: 2.

Consultants in the Indian Health program of the Public Health Service: 2.

Consultant in the National Tuberculosis Association: 1.

Health educators in Public Health Service regional offices: 2.

Faculty member of a school of public health in a State university: 1.

Professor of health education in a State university: 1.

Supervisor of health and physical education in a State department of public instruction: 1.

Fourteen respondents provided the unsolicited information that, although they were not currently in paid employment as health educators, they had participated as volunteers in a wide variety of health programs. These activities included:

Organizing the city for a poliomyelitis drive.
Serving on the American Red Cross health committee.

Chairing the health committee of the community chest.

Working with citizens groups to improve the State's public health laws.

Member of board of directors of the mental health society.

Member of board of directors of a tuberculosis association.

Teaching mothers' classes in the town's nursing service.

President of a State education association.

Committee member of the maternal health association.

Chairman of the YWCA health committee.

Member of the Committee on Local Resources of the League of Women Voters.

Health chairman of a parent-teacher association.

Education director of the citywide X-ray survey.

Member of the executive committee of a tuberculosis and health association.

Secretary of a community health council.

Member of the national board of YWCA.

Member of a local council of Girl Scouts of America.

Summary

The fellowship program of the W. K. Kellogg Foundation financed the training of 47 public health educators and stimulated the expansion of such training for more than a thousand others. Today, 15 years after the awarding of the first fellowship, a review of the professional activities of 38 of the 47 candidates who were awarded fellowships finds many of them in responsible positions in the public health field.

error's office. In 1957, there was considerable pressure upon the State legislature and the Governor's office to license chiropractors in New York State. The Governor's office, aware that several State departments would be affected by such legislation, requested the board to study the matter. In another instance, after the Governor's conference on financing health costs for the aging in December 1956, the recommendations made by the three sections of the conference were referred to the board by the Governor's special assistant on problems of the aging for analysis and recommendations.

5. Special projects accepted by the board after its consideration of suggestions referred by outside agencies, such as the request of the State medical society for a study of the standards for orthoptic technicians working under the supervision of ophthalmologists.

6. Special projects accepted by the board upon consideration of recommendations made by one of its members, by its executive director, or by one of its advisory committees. For example, the commissioner of education, a member of the board, requested that the board undertake a study of the problem of "baby nurses," a term used for women who have taken courses in maternity and infant care at unlicensed schools. Although possible violations of the Nurse Practice Act were involved, the problem was referred to the board on the basis that it was of equal concern to the departments of health, social welfare, and education.

In planning its work, the board believes that its activities in joint planning and program development should continue as long as such activities are considered by the board members to be productive and beneficial. However, in accord with the philosophy underlying the board's establishment, research and demonstration projects must either be self-limited or be transferable to an appropriate permanent State administrative agency at a feasible time. The board is not to engage in long-term operating activities on any one particular program.

Methods of Operation

The functions of the board are carried out through one or more of the following methods:

By direct operations of the board's staff. Obviously the small size of the board's staff, with 4 of the 7 persons in nonprofessional grades, would curtail the board's activities if the staff was its only outlet for operations. The staff is the board's working arm and is responsible for initiating all of its functions. However, a considerable part of its work is done through the arrangements described in the remaining paragraphs of this section.

Through the operations of special board committees. For each major function undertaken by the board, there is a board committee whose individual members are experts from various disciplines and are appointed by the commissioners concerned with the problem at hand. The committees meet regularly with the executive director, assist in planning and developing projects, and put at the disposal of the director and board the required facilities and services of their respective departments.

Through advisory committees in special fields. The advisory committees meet about four times yearly and consist of experts in their respective fields, not associated with government. Their responsibility is to recommend new areas for exploration and to explain the board's functions and projects to appropriate professional groups and to the public.

By contracts with universities, medical schools, or hospitals. These agree to undertake special studies with financial assistance obtained by the board. In this way, the board has been able to carry out several major research projects on mental retardation and mental illness among children and on chronic alcoholism.

By joint studies with professional associations and voluntary health agencies. For example, the board is cooperating with the Hospital Association of New York State in a study of admission of chronic alcoholics to hospitals. The study of orthoptic technicians, referred to above, was a joint undertaking with the New York State Medical Society.

Examples of Activities

From the beginning, it was evident that one important aspect of the board's operations applies to all activities and is requisite to the

sion, who generously and effectively contributed whatever time he could spare from his very busy schedule.

The Mental Health Commission was formed by a legislative act in 1949 and included as members the commissioners on the Interdepartmental Health Council, plus the commissioner of correction. The commission had a full-time staff of administrators and research workers, and it was able to develop several major research projects in the field of mental illness and mental retardation. It also developed the basic groundwork upon which the New York State community mental health services program was established in 1954.

It was the unanimous decision of all commissioners concerned that interdepartmental work in both physical and mental health could be more effectively implemented and developed through a single, organized State agency. Their recommendations to this effect were accepted by the Governor and the necessary legislation was passed to establish the Interdepartmental Health Resources Board on April 1, 1956, for a period of 4 years.

Organization

The membership of the Interdepartmental Health Resources Board includes the commissioners of health, mental hygiene, education, social welfare, labor, and correction, the chairman of the Division of Parole and of the Workmen's Compensation Board, and the executive director of the Joint Hospital Survey and Planning Commission.

A chairman is elected annually by a vote of the members, with no member serving in this capacity for more than 1 year at a time. The commissioner of mental hygiene, Dr. Paul H. Hoch, served as chairman during the first year. He was succeeded by the commissioner of social welfare, Raymond W. Houston.

The board is responsible to the Governor and the State legislature and must submit to them an annual report of its activities and such recommendations as it may deem appropriate.

The legislation empowered the board to employ an executive director with the responsibility of carrying out its administrative duties in accordance with its established policies,

rules, and principles. After considering the responsibilities of the executive director, the board decided during its early meetings that the position could best be filled by a physician with training in public health and with considerable administrative experience. At the present time, the executive director is assisted by a staff consisting of a nonmedical assistant director trained in public health administration, a biostatistician, a secretary, a stenographer, a typist, and an account clerk. In addition, the board is authorized to request assistance from any member, department, or agency that will enable the board to carry out its activities properly.

Determination of Assignments

The general objectives of the Interdepartmental Health Resources Board are (a) to provide for joint planning and program development in health matters of interdepartmental concern, and (b) to formulate and execute research studies and demonstration program that will provide the board and member agencies with information and guidance for long term planning.

Specific projects may come under the board's jurisdiction through several channels which may be classified as follows:

1. Functions specifically designated by the 1956 legislative act which established the board. This act outlined projects which might be undertaken in health services for the aging, rehabilitation, mental retardation, services for emotionally disturbed children, and alcoholism.

2. Functions specifically assigned the board by other legislation. For example, an act passed by the 1956 session of the State legislature gave the board, as successor of the Mental Health Commission, responsibility for establishing pilot centers for diagnosing mental retardation in children and counseling parents.

3. Functions assigned by special budgetary appropriations to the board. In the 1956 State budget, the establishment of a pilot facility for adults addicted to narcotics was delegated to the board when the latter became functional.

4. Special studies requested from the Gov-

rehabilitation services and to develop a mechanism whereby such services may be received.

Also under study is the care of young adults who have no potentialities for further rehabilitation, who are unable to provide care for themselves, and who cannot be suitably placed in infirmaries or nursing homes because of the predominantly elderly population of these institutions.

Aging

The legislative act on aging which founded the Interdepartmental Health Resources Board requested it to develop and formulate "a master plan for establishing responsibility for planning, financing, administering, and coordinating the total array of personal health and mental health services to the elderly." Based on its review of reference materials, plus its evaluation of the current State and local programs, the board's Committee on Health Services for the Aging analyzed (a) the specific mental and physical health needs of the aged, (b) the resources available in the State to meet these needs, (c) the deficiencies in meeting these needs, and (d) recommendations for overcoming the deficiencies.

The board drew this material together as a planning guide for the executive office and the State legislature.

Retarded and Disturbed Children

The board has established three pilot clinics to provide diagnostic services for mentally retarded children and counseling for their parents. It is also studying these clinics and similar facilities to determine their role in meeting community needs. In addition, several research projects have been completed or are underway on such matters as the adjustment of the severely retarded adult in the community, the preinstitutional workup of the mentally retarded person entering State schools, and the psychological and social development of children in classes for the severely mentally retarded.

A major study is being completed on characteristics of emotionally disturbed children referred to residential treatment centers. A similar study is underway on children referred to day-care centers.

Alcoholism

The board supports a major research center on alcoholism at the State University College of Medicine in Brooklyn. It expects that the findings here may be used in clinics throughout the State. In addition, the board has established a training program for persons in various disciplines who are engaged in or plan to engage in community control of alcoholism. For the development of clinics at the community level, the board is working closely with the division of community mental health services of the department of mental hygiene. At present, the board's Advisory Committee on Alcoholism is studying the State program in order to develop a more comprehensive approach.

Discussion

With its year and a half of operating experience, the New York State Interdepartmental Health Resources Board has effectively achieved interdepartmental cooperation, planning, and program development. With a full-time staff and the authority bestowed upon it by the State legislature, the board has made a positive approach to complex health problems involving several State departments and often many other agencies, and has formulated recommendations based on the accumulation of pertinent information and the exercise of sound deliberations.

The board's monthly meetings have permitted the functioning of its staff and of the committees and agencies working with that staff to be reviewed, and have resulted in a stimulating exchange of opinions on matters of joint and mutual concern. Matters of particular urgency may be taken up at any time through special meetings of an executive committee consisting of the commissioners of education, health, mental hygiene, and social welfare. Of particular importance, for example, may be legislative proposals concerning two or more departments. A comprehensive understanding, gained through discussion of the effect that the proposed legislation may have upon all the State's health programs, may lead to concerted action. This is in contrast to a multiplicity of conflicting approaches which

board's proper functioning in joint studies, planning, and program development. The board obviously offers an organized means of exchanging information among the member agencies on their specific health problems, on their individual philosophies and policies, and on the development of new programs which may be related to, and may serve or be served by, the operations in other agencies.

This function applies equally to the regular board meetings attended by the commissioners and agency directors and to the meetings of the special interdepartmental committees.

The major activities of the board encompass the fields of rehabilitation, aging, mental retardation, emotional disturbances in children, and alcoholism.

Rehabilitation

The committee advises the Joint Hospital Survey and Planning Commission on the construction of rehabilitation facilities.

Projects developed by the division of vocational rehabilitation of the State education department are considered by the committee in relation to the needs and resources of the projects.

The committee is offering technical guidance to the rehabilitation survey of the workmen's compensation program.

A subcommittee served on a joint advisory committee for the northern New York rural rehabilitation survey which was completed during the summer of 1957. This was a joint effort of the Saranac Lake Rehabilitation Guild, the State University College of Medicine at Syracuse, and the New York State Department of Health. Because of the project's interdepartmental nature, the commissioner of health requested the committee on rehabilitation of the former Interdepartmental Health Council to represent it on the advisory committee. This function was carried over when the board was established.

The purpose of this survey was to identify disabled persons in the northern New York rural area, to determine their needs in relation to vocational goals or increased self-sufficiency, and to determine the necessary facilities and personnel required to meet these needs. The subcommittee representing the State in this

project included the assistant commissioner for vocational rehabilitation and the director of the division of vocational rehabilitation of the State education department, the assistant commissioner for medical services of the State department of health, the executive director of the Joint Hospital Survey and Planning Commission, and the executive director of the Interdepartmental Health Resources Board.

The committee is currently engaged in a study of job vacancies in rehabilitation, including physical, occupational, and speech therapy, clinical psychology, rehabilitation counseling, and medical and psychiatric social work. In this connection, it is working with the New York State Department of Civil Service and is attempting to define the factors which make it possible to fill some positions while other positions remain vacant. The committee offers a booklet on scholarships available to residents of New York State in rehabilitation work. This booklet has been distributed to rehabilitation facilities, medical schools, hospitals, and voluntary agencies throughout the State.

Recognizing a lack of knowledge and understanding of the services for epileptics in New York State, the committee published a statement in the *New York State Journal of Medicine* outlining the services available in vocational rehabilitation, selective placement, health, and mental hygiene, and put reprints at the disposal of rehabilitation medical facilities throughout the State.

The committee is analyzing the objective of sheltered workshops operating in New York State as well as the extent to which such objectives are being met, the cost of operation, and the methods employed. The committee is also seeking to determine what will be needed to expand this important service.

Realizing that a large number of disabled persons are not receiving services, the committee is studying the extent of State rehabilitation services and the possibility of their expansion.

At the request of the commissioner of correction, the committee is examining disabilities in State correctional institutions, with Attica Prison and Elmira Reformatory serving as pilot studies. The purposes are to determine the extent to which disabled inmates require

Guidelines

for

the

Health

Administrator

JAMES R. SHAW, M.D.

The following is, in essence, the text of a memorandum written by Dr. Shaw, who is chief of the Division of Indian Health, Public Health Service, on the subject of basic considerations in health administration. Although the piece was composed specifically to guide new medical officers in charge of Indian health installations, health administrators in all fields may find that its philosophy strikes a resonant chord for them.

THE SUCCESS of any health operation depends in large measure upon the first impression it registers with the patient and his family on their initial contact with its employees. These first impressions set the pattern for future interpretations; they determine the lasting concepts of the operation formed by individual patients and the public generally. Hospitals and clinics take on personalities that are just as distinctive as those of any physician, nurse, or other staff member. The hospital personality, however, is the product of all of the personal traits of those who make up its human element.

Patients and visitors—adult or child, literate or unlettered, of the dominant culture or of a minority group—inevitably sense the underlying attitudes and motives which give the hos-

pital its personality. This consciousness does not require that they understand the professional terms, techniques, and procedures used in their behalf—or even that they understand simple English. But they feel and respond to a general spirit of warmth and sympathy, of understanding and support, when this is offered as the foundation of assistance.

A physician always will need assistance in the performance of his duties; around these duties all of the other activities of the hospital, clinic, office, or field program revolve to lend support. The physician must realize that his success does not depend entirely upon his own actions and ability. His success also depends in part upon the actions and abilities of others, and upon impressions made on the patient by these other individuals. The physician must never forget that he alone is responsible for the end result. Consequently, it is of the greatest importance that he be the true leader of the health team and that he accept responsibility for the personality of the health operation in the eyes of his patient, the patient's family, and the community. The public attitudes toward the operation—good or bad—will develop continuously on a progressively broader base in the direction determined by this concept of personality.

Not by Bread Alone

All of us have certain basic needs that must be met if we are to do a good job and maintain high morale. This is true of all of us—physicians, firemen, nurses, ambulance drivers, and others—and it is true regardless of remuneration received. While dissatisfaction with pay sometimes is the apparent cause of an employee's discontent and desire to change jobs, a good administrator will look first for a more probable "real" cause before considering the subject of remuneration.

Every employee must feel that the program in which he is participating is intrinsically worthwhile and that he is making a valuable contribution. Moreover, he must feel that his contribution will be recognized and appreciated. Each employee must feel that he is not at a dead end, and that progress or growth related to his work is possible within the limits of his desire and ability.

might otherwise result when departments make individual studies and take separate actions.

Obviously a pattern for interdepartmental cooperation among State agencies must be designed to meet the needs of a particular State, depending upon its laws, traditions, and resources. Several States have developed interdepartmental planning committees, of short or long duration, to tackle specific problems. Others have informal mechanisms for general exchange of information among departments. However, New York State's formal agency, with its own staff to work for regular interdepartmental cooperation and joint planning, would seem worthy of trial in other States.

The same would appear to be true of large cities or regional areas. In 1952, New York City, upon authority of the mayor's order, established an interdepartmental health council patterned after the State council then in existence and consisting of the city commissioners of health, welfare, and hospitals. The executive director of the community mental health services program has since been added. The council meets monthly; its steering committee of deputies meets weekly. While lacking a full-time staff (only a secretary for its subcommittee on aging and the secretary's stenographic aides are full-time), and being more limited in membership than the new State agency, the council has been very effective in bringing about coordinated planning and joint action.

Yet the general development of interdepartmental cooperation has been very limited at both State and local levels. In a 1956 study of cooperation between departments of health and welfare, for example, Muller and Bierman found relatively little growth during the preceding 5 years (2).

In commenting upon the problem of rehabilitation during his recent legislative message, Governor Averell Harriman made the following statement, which seems pertinent here (3):

"No phase of our total work in the conservation of human resources, as well as in combating the problem of low income, is more promising or exciting than the work of rehabilitation. Under the general coordination of the Interdepartmental Health Resources Board, created upon my recommendation 2 years ago, we have achieved a teamwork and cooperation among the various agencies concerned superior to anything that was possible before."

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Health Law Center

The University of Pittsburgh has established a health law center within the Graduate School of Public Health. The law center will study the legal aspects of medicine, dentistry, nursing, public health, hospitals, and medical care. It will also be a clearinghouse for legislative and other legal materials in the health fields. In effect, the newly created health law center will be continuing and expanding services initiated under a grant from the National Institutes of Health, Public Health Service, which in 1956 provided funds for research into hospital law. Results of that study will be published in a 2-volume manual on hospital law for hospital administrators and attorneys.

bilities are sufficiently experienced to recognize that unilateral administration fails in at least two important respects. It does not provide for professional development of employees—the growth from within which insures the “organization in depth” essential for continuity in operations. It does not contribute to high employee morale, without which the operation cannot continue for long to achieve good results. Eventually, every one-man operation strikes a ceiling beyond which it cannot function satisfactorily.

Group administration requires mutual understanding of the problems, uniform direction of the program, and establishment of a common goal. Each member of the group must think not only in terms of his own specific functions but as well in terms of the relationship of his actions to common efforts to achieve the goal. Without this unity of purpose throughout the organization, its efforts will suffer.

This common approach toward clearly identified goals can be achieved with the help of frequent short meetings where frank discussion and exchange of ideas are encouraged. Such meetings, of course, should be limited to specific considerations. Subjects can be sufficiently broad to include problems of overall administration. In such meetings the administrator must direct the discussion toward the common objective, and he must draw from the participants their ideas relating to broader aspects of the program as well as to their own functions. Through this process the problems which sometimes arise in connection with jurisdictional lines will be minimized, mutual understanding will be fostered, and mutually supporting efforts will result. Many administrative problems will yield to the pooling of ideas and opinions, and others will be placed in proper perspective for further study. But equally as important, the members of the group participating will develop a real sense of teamwork. With firsthand information and broader understanding of program objectives, they will be able to make better decisions in the conduct of their own work.

This is the technique of sound health administration. It requires only a mature, understanding, and secure individual to put the process in operation.

The Good Health Administrator

A good health administrator is qualified in his profession, meticulous in his adherence to ethical practices, and possessed of high ideals and integrity. He is mature in judgment, emotionally secure, warmly human, and—in the eyes of his subordinates—understanding and helpful. The good administrator is a true leader, one who can encourage and inspire his subordinates. He makes friends readily, and he is unfailingly loyal to those who serve under him as well as to his superiors. He recognizes good work promptly, gives credit where it is due, and criticizes constructively and in private. He is both fair and firm, and he is willing to back up those who assist him in meeting program objectives. A good listener, he is able to gather all the facts upon which to act, and to act decisively and promptly without jumping to unwarranted conclusions. He has the ability to seek out the strong points in those who work under him, to cultivate these talents, and to create an environment that insures growth of his organization from within.

The good administrator never forgets that the conduct of his program is his responsibility and his alone. He recognizes that his subordinates to whom he delegates functions are helping him in carrying out his responsibility, and he earnestly appreciates their efforts. Routinely, the good administrator personally visits more or less regularly all of the areas and activities for which he is responsible. In this way he is closer to the problems, frustrations, accomplishments, and capabilities of his people. He establishes and maintains a clear-cut chain of command with properly delegated responsibility and authority. He insures that channels of communication are adequate, that they run up as well as down, and that they are adapted to the needs of the program. He establishes and maintains a fair procedure for dealing with grievances; he sees to it that this procedure is known; and he encourages its use in the interests of the employees.

This is the profile of a good administrator. The exact techniques and the specific approach will vary with the personality of the individual to whom leadership is entrusted. The principles, however, remain constant in all situations and in operations of all dimensions.

An employee has the right to expect to be consulted on matters pertaining to himself or to his position. He is entitled to reasonable leeway in adjusting to his position and responsibilities in his own way. Such a policy builds confidence and encourages initiative and acceptance of responsibility. The administrator's job satisfaction comes from the success of all, welded into a coordinated, aggressive, successful organization which shows evidence of growth from within.

Ars Medicinalis

The science of medicine continues to expand and become more exact with each passing day. However, there still exists an undiminished need for the practice of medicine as an art. In fact, the success of the scientific procedures may very well depend upon the successful practice of the art of medicine. There always will be broad vistas in the general field of medicine which have not been, and perhaps never will be, filled in by the scientific approach alone.

The practice of medicine as an art is essential because of the basic needs of patients over and beyond their requirements for the application of therapeutic agents and scientific procedures. A patient goes to a physician, or is brought to a medical facility, to get help. His need may lie in conditions which range all the way from acute illness or trauma threatening early death to a state involving no organic disease but requiring psychic support. Whatever the patient's condition may be, he and his family are seeking the physician's assistance in the solution of a problem which is of grave importance to them. Regardless of the exact nature of his problem, the patient can reasonably expect a warm, friendly, relaxed atmosphere and sympathetic understanding. He has, or he hopes to have, confidence in the advice given him so that he can make the decisions necessary for the solution of his problem.

The patient and his family expect to be consulted on all matters of importance so that they can make the necessary decisions—or at least participate in the decision making—after they have an acceptable understanding of the facts upon which the decisions must be based. The patient and his family can reasonably expect

stability and maturity on the part of the physician and his prompt attention as the circumstances warrant. They are entitled by law to the preservation of the confidentiality of personal medical information which becomes known to the physician or health facility, and they are entitled to the respect for their human dignity which is the right of all individuals in our society.

These considerations assume added importance when we remember that in acute and catastrophic illness or injury there may be some degree of self-accusation or guilt on the part of the patient, his family, or others concerned. This is particularly true when life and death hang in the balance. It may be manifested by complaints, acts of aggression, or just plain hostility. Such attitudes need never occur, or only rarely, if the basic needs of the patient and his family are met adequately in the practice of medicine as an art as well as a science.

Administration by Group

Administering a health facility or program is primarily a matter of conducting the routine activities in a way that meets the basic needs of patients, their families, and the employees.

The group method of administration is most effective in meeting these needs satisfactorily. In essence, the method permits broad participation in considerations and decisions and delegation of responsibility with commensurate authority. If the method is properly used, if the administrator makes really effective use of the potential and immediately available talent at his disposal, the administration will be sound even though the administrator himself has not had formal training or wide experience in administration. Of course, the administrator must possess personal stability and maturity and must be able to make a firm decision after an objective evaluation of recommendations from his staff and others directly concerned.

We occasionally encounter an operation that is achieving creditable results as a "one-man show." However, this requires exceptional capabilities on the part of the man who is administering it. Most men who have such capa-

Recent developments in drugs and medicines, changes in the size of manpower engaged in their production and compounding, changes in the nature of products, materials, and dosage forms, cost and price developments, and changes in the dollar volume of prescription pharmaceuticals are reviewed.

Drugs and Medicines

LUCY M. KRAMER

OVER the past few decades, new drugs and medicines have contributed importantly to progress in public health. "Miracle" drugs have lowered national death rates and sharply reduced acute communicable diseases.

Since the introduction of sulfa drugs in 1937, deaths from influenza-pneumonia have decreased 75 percent, from 114.9 per 100,000 in 1937 to 27.1 per 100,000 in 1955 (1). The principal diseases of childhood—scarlet fever, streptococcal sore throat, diphtheria, whooping cough, measles—which caused 10 deaths per 100,000 children in 1945, in the space of only 10 years dropped to 1 death per 100,000, a decrease of 90 percent (2). According to unpublished data of the National Office of Vital Statistics, the mortality from all infectious diseases dropped in 50 years from 676.2 per 100,000 in 1900 to 44.3 per 100,000 in 1956.

Drugs and medicines have transformed both the practice of medicine and the patients' use of health services. The drug industry responsible for the development, production, and distribution of these products has helped to support medical research in its own laboratories and in the medical schools, universities, and teaching hospitals of the country. The industry is presently participating in the extensive cancer chemotherapy studies of the Na-

tional Institutes of Health, Public Health Service. Drug firms and community pharmacists also have assisted in the health education programs of health departments and voluntary health agencies.

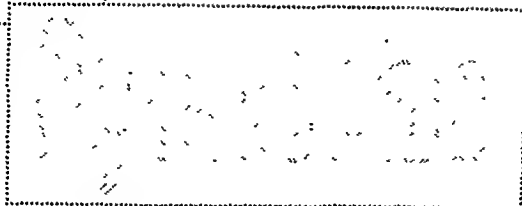
Pharmaceutical Manpower

About 2 million persons are employed in health occupations. About 111,000 of these are registered pharmacists (3). In addition to those directly employed in the provision of health services, nearly 200,000 are engaged in supplying goods and services essential to health occupations (4). According to the 1954 Census of Manufactures, these persons were engaged in affiliated industries such as the production of scientific and professional instruments and supplies (including medical, surgical, dental, and optical); biological, medicinal, chemical, and pharmaceutical preparations; ophthalmic goods; X-ray and therapeutic apparatus. Of these, the largest number—some 92,000—were engaged in the manufacture of drugs and medicines. In addition to skilled operatives, clerical, and other employees, the drug firms reported 380 physicians in their employ as of January 1957 as compared with 155 ten years before and 65 twenty years earlier. The total number of employees with graduate degrees in the medical and allied sciences was 3,000 as of January 1957 compared

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Signs

and



Desalting Water

Coalinga (population 6,000), Calif., will be the first community in the United States to obtain its entire supply of drinking water through electronic desalting of brackish water.

An \$80,000 apparatus will produce 28,000 gallons of drinking water daily at a cost of about \$1 per 1,000 gallons after the unit is paid for.

Coalinga has been carrying drinking water by railroad from Armona, 45 miles away, at a cost of about \$7 per 1,000 gallons. The city's well water contains approximately 2,000 ppm of salt.

Voluntary Admissions

A new provision in New York State's mental hygiene law reduces from 60 days to 15 days the maximum time a voluntary patient may be detained in a State hospital at the discretion of the director. It also reduces from 15 days to 10 days the time a voluntary patient may be detained after he has given written notice of his intention to leave.

Operation Cleanup

Sanitary conditions in Laredo, Tex., have been improved as the result of a 4-stage vector control project. To reduce the large rat population and vast numbers of flies and mosquitoes at peak season, the city attacked the breeding and feeding grounds (refuse dumps, privies, ill-kept garbage cans, and open, flat trucks used for refuse removal) as well as the vectors directly.

In cooperation with the city of Laredo, the Texas State Department

of Health and the Public Health Service began the project in 1954 with surveys of unsavory spots, sewage facilities, and waste disposal practices. Ten covered trucks were purchased to carry refuse to the new controlled sanitary landfills. Galvanized garbage cans, placed on elevated racks, were bought by 10,000 families in 1 month.

Since most of the privies were near sewer lines, nine different plans were applied to help small homeowners without funds to install modern plumbing. The city also began extending its sewer lines.

Warfarin reduced the proportion of rat-infested premises from 75 to 5 percent, with a consequent disappearance of typhus fever. Sprays cut down flies and mosquitoes, with a consequent drop in the incidence of diarrheal diseases. Insecticides and rodenticides, however, are only used as a supplement to the main work of eliminating breeding potentials.

The project continues with plans to create parks and playgrounds over landfilled areas.

X-rays Discontinued

The Christmas Seal mobile X-ray unit of the Buffalo and Erie County Tuberculosis Association was officially discontinued in July 1958. When special circumstances warrant, services for select groups will be arranged by the association with the Erie County and New York State Health Departments' X-ray units.

Appointments

The American Public Health Association has announced five new appointments: Dr. Thomas Hood,

associate executive director; Dr. James L. Troupin, assistant director assigned to the association's committee on professional education; Noble Swearingen, director of Washington, D. C., office; Robert Mytinger, director of western regional office, San Francisco; and Dr. Edward Wellin, who will study the relation between public health and the behavioral sciences.

Indian Self-Help

Indians are helping themselves to health. Ute tribal council financed \$100,000 water system to serve 100 homes in Towaoc, Colo. Navajo tribal council budgeted \$206,750 for 1959 for equipment in health facilities, emergency care for students, prosthetic appliances, hearing aids, and glasses. Navajos also offer free layettes for babies born in hospitals or brought to hospitals for examination in their first month.

Immunization

A complete immunization program, reported as a "first" in the State, has been set up for all patients and employees in Pennsylvania's State institutions.

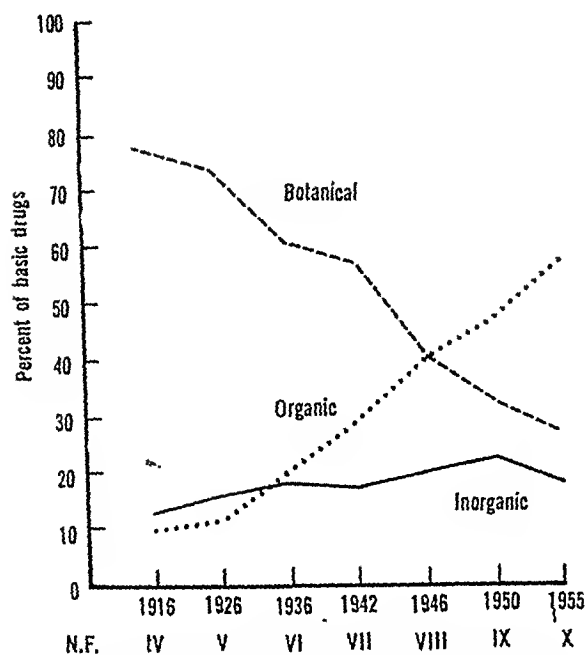
Patients and employees will be immunized against smallpox, diphtheria, tetanus, typhoid, influenza, poliomyelitis, and tuberculosis.

Sanitarians in the Butte County Health Department, Calif., have inspected the operational safety of X-ray units of 50 physicians, veterinarians, and dentists at their request.

A health education show last August, the first to be held in New York City's Coliseum, attracted 40,000 visitors.

Burning discarded automobiles and parts in the open air has been banned in New York City. It is estimated that 200,000 cars had been burned annually in the city by automobile wreckers. Incinerators now on the market will take over the job.

Figure 1. Trend in National Formulary basic drugs, 1916-55.



SOURCE: Reference 12a. Based on Journal of the American Pharmaceutical Association (Practical Pharmacy Edition) 16: 424-425, July 1955.

Pharmacopeias as shown in table 1 also reflect the tremendous increase in certain types of drugs during a 5-year period. The fifteenth U. S. P., released in August 1955, lists almost 250 new drugs that have been officially accepted for inclusion after stringent review (12a). The new U. S. P., scheduled for publication in 1960, will have an even larger number of new drugs.

Since 1948, more than 3,000 new prescription drug items have entered the market, each with an average life span of 2 to 5 years, and the forecast for new drugs looks even busier (13). In 1940, less than 100 new specialties were introduced (14). In 1957 alone there were 400 new pharmaceutical products put on the market, some of which were entirely new chemical entities; others, new combinations or new dosage forms of less recently new drugs (15, 16a). It has been said that a majority of the prescriptions written today could not have been filled 20 years ago since many of the drugs now used were unknown. Sulfa drugs were introduced in 1937; penicillin in 1940; streptomycin in 1946; antihistamines in 1947; cortisone, ACTH, and hydrocortisone in 1950

and 1951; chlortetracycline U. S. P. (Aureomycin), chloramphenicol U. S. P. (Chloromycetin), and oxytetracycline U. S. P. (Terramycin) in 1950; rauwolfia and certain types of psychopharmacologic agents (for example, meprobamate) in 1953.

In dollar value of total prescriptions filled, antibiotics today account for about 25 percent of total volume (16a). Antibiotics also represent about 25 percent of drug purchases in Public Health Service hospitals (17). (An economic study by the Federal Trade Commission of the entire antibiotic industry, covering prices in particular, but also including patents, manufacturing processes, and other aspects, was recently published, and should throw needed light on this extensively used drug category.)

About 7 cents of every dollar spent for drugs in Public Health Service hospitals in fiscal 1957 was for psychopharmacologic medications (tranquilizers) (17). The proportion is expected to go higher in 1958. Expenditures and use with respect to tranquilizers by the general population parallels Public Health Service experience.

The future of the drug industry is now based on constantly developing new products. A president of one of the leading drug firms has stated "the pharmaceutical industry lives in the shadow of its own obsolescence" (16b).

With the intensified current basic research

Table 1. Changes in principal categories of drugs included in United States Pharmacopeia

| Drug categories | U. S. P. XIV (1950) | U. S. P. XV (1955) | Percent increase |
|-------------------------------|------------------------|-----------------------|---------------------|
| | Number of categories | | |
| Antihistamines..... | 2 | 13 | 550 |
| Antibiotics..... | 5 | 12 | 140 |
| Diagnostic aids..... | 9 | 16 | 78 |
| Endocrine preparations..... | 18 | 25 | 38 |
| Analgesics and sedatives..... | 18 | 21 | 17 |
| Biologicals..... | 29 | 34 | 17 |
| Chemotherapeutic agents..... | 27 | 31 | 15 |
| Vitamins..... | 13 | 15 | 15 |

SOURCE: Reference 12a. Based on Journal of the American Pharmaceutical Association (Practical Pharmacy Edition) 16: 424-425, July 1955.

with 990 ten years before and 300 twenty years earlier (5).

The number engaged directly in health occupations or in affiliated industries is approximately double the 1.1 million estimate of 1929, the latest year of high-level employment in the pre-antibiotic era (6).

The number of pharmacists, however, has not grown correspondingly. Wholly comparable figures for the several decades are not available. Rorem and Fischelis reported for 1931 some 115,000 registered full-time pharmacists in the United States, and a total of about 130,000 individuals legally recognized to practice pharmacy either as fully registered pharmacists or as auxiliary assistants (after making a correction for the many duplicate registrations, that is, registrations issued to the same individual by several States) (7a). In 1955 some 158,775 registrations were held by pharmacists in good standing (many of them duplicates), of which 110,992 were held by pharmacists engaged in active practice in the various States (8a). By the end of 1956, the number of such registrations had increased to 162,459 (9a), but the number held by pharmacists engaged in active practice had decreased slightly to 110,688 (9b). It appears that the number of active pharmacists has not changed materially since 1931.

For the Nation as a whole, in 1955 there were 67 practicing pharmacists per 100,000 population, about half the physician-population ratio. About 89 percent of the pharmacists were engaged in retail pharmacies, 4 percent in hospital pharmacies, 6 percent in manufacturing or wholesale establishments or as representatives of the establishments, and 1 percent in teaching or government positions (8b). Today, about 10 percent of new graduates are going into hospital pharmacy work, and more than 5 percent of the total working pharmacist population is currently so employed (10a). Thirty-eight percent of the pharmacists employed in hospitals and 6 percent in the profession as a whole are women (10b).

The Census of Pharmacy reports that there were 52,779 retail pharmacies at the end of 1955 and 1,176 hospital pharmacies dispensing drugs and medicines. In addition 37,515 dealers other than pharmacists were licensed

in the various States to sell packaged drugs (8c). The number of retail pharmacies has declined absolutely since 1929 (from approximately 60,000 to about 53,000 in 1955), and in proportion to population (7b, 8c). In the 40 years prior to 1929, the population per drug store declined somewhat. In 1890 the population per drug store was 1,838 and in 1895 it was 1,745. By 1903 the ratio had increased to 2,030 persons per drug store, where it remained almost constant for more than 25 years. Since 1929 the population-drug store ratio has increased from 2,020 (7c) to 3,126 in 1955 (8c), that is, there are fewer drug stores for more people (with a trend toward larger prescription departments and less general drug store merchandising).

In contrast the drug manufacturing industry has expanded markedly since 1929 in number of employees. Almost four times as many employees were engaged in the manufacture of drugs and medicines in 1954 (11) as were employed in 1929 (7d).

Products and Materials

The drug industry since the advent of sulfa drugs in 1937 has been characterized by rapid change. The rate of change has been so accelerated that progress in the last 30 years may well have exceeded that of several centuries before.

A recent analysis of the basic drugs listed in the National Formulary between 1916 and 1955 reflects the sharp change in the relative importance of basic materials in the drug industry (12a).

In 1916, almost 80 percent of the basic drugs were of botanical origin, 10 percent of organic chemical origin, and 10 percent of inorganic chemical origin. In 1955, the use of botanicals had dropped to 30 percent, organic chemicals had risen to 50 percent, and inorganic chemicals to 20 percent (fig. 1).

Botanical sources have been replaced by organic chemical sources that are more easily available, more concentrated, more easily controlled in their manufacture, and more specifically effective.

Changes in the principal categories of drugs listed in the 1950 and 1955 United States

and chemical industry, he is required to have scientific knowledge and the ability to impart and use it effectively in selling prescription drug products (22). He often is a pharmacist, sometimes a medical student or graduate, always a well-informed individual. His duties are to visit physicians, dentists, veterinarians, wholesale and retail druggists, hospitals, clinics, and dispensaries, exporters, and all other possible purchasers of his company's pharmaceutical preparations. He is the means by which the results of research and development become directly known and used. Although exact figures on the number of such "detailmen" currently in the labor force is not available, the number of registered pharmacists alone representing manufacturers and wholesalers of drugs increased from 2,415 in 1955 to 2,739 in 1956 (8b, 9c).

Dosage and Dosage Forms

The Bureau of Labor Statistics has for many years included in its medical care component of the Consumers Price Index a breakdown of drug items used in selected prescriptions with the content and dosage form carefully specified. A typical prescription unit for pricing is specified as a "capsule" prepared by a compounding pharmacist.

The pharmacist-compounded capsule era, together with the era of powders and potions in medication is ending, however. By 1955, tablets produced by a pharmaceutical house in wholesale quantities represented the typical dosage form; parenterals and liquids held second place. Together they accounted for about 75 percent of the new drug dosage (12a).

Analysis of the 20 largest volume prescription items currently being dispensed in a Public Health Service outpatient pharmacy shows that 13 of the 20, or 65 percent, are dispensed in tablet form.

Aspirin, which leads all other drugs in volume of output—16½ million pounds in 1956, an increase of 159 percent in the last 16 years—is one of the tablets that has become standardized in content, shape, and size.

Not only has the tablet become the typical dosage form, but the efficacy per tablet is constantly being increased. A penicillin tablet

with a built-in delayed action mechanism has been developed which would require only one tablet per day for 24-hour medication. Other tablets (and some capsules and granules) have been developed and marketed recently which contain in one medication several different drugs in various doses that are released into the system at various times.

The traditional injection of insulin may someday be replaced by a tablet, and has already been in certain cases. A sulfa drug, tolbutamide (Orinase), has been used in about 250,000 cases of diabetes, most of them mild, and on patients over 20 years old. Its efficacy depends on prodding the pancreas into doing its own work. Oral medications are less traumatic than hypodermic injections, are considerably less dangerous and troublesome, and require no sterilization (23).

The controllable techniques involved in the production and distribution of tablets, the standardization of size, shape, and color, the stability of the product, the general public acceptance of tablets as a form of medication, and the ease with which dosages can be taken, all contribute to the increasing manufacture and use of tablets as dosage forms.

Cost and Price Trends

Medications have become more complex, more effective, and more expensive. Writing about 1929, Rorem and Fischelis stated: "The amounts spent by individuals or families for drugs and medicines during a given period do not show a wide variation, and seldom, if ever, amount to totals which are catastrophic in their effects" (7h). Individual prescriptions, however, are now far more costly and families may incur sizable drug expenses especially in cases of prolonged or chronic illness. Children for whom maintenance dosages of antihistamines and other drugs are prescribed, for example, may have long-term drug bills of \$15 or more a month, without any allowance for cost of additional dosages required during acute stages of illness. Older people with cardiac, hypertensive, or arthritic conditions may have maintenance medications prescribed for them which total \$25 or more a month. In the 1952-53 study of family medical expense it

in mental illness, coronary diseases, cancer, and chronic problems of old age, a poll of leading drug company executives indicates that they expect drugs affecting these types of illnesses to be important in the next 5 or 10 years (16b).

Highlighting the anticipated drug needs of the future are the following (18):

1. Drugs which will permit therapeutic approaches to a variety of mental illnesses and personality problems.
2. New chemical and antibiotic treatments to arrest certain forms of cancer.
3. New treatments for the prevention and cure of hypertension and other circulatory ills.
4. New developments to control degenerative diseases.
5. New discoveries for the better management of nutrition.
6. New products to subjugate a number of the still resistant viral diseases.

Pharmacist and New Products

One consequence of the newer drugs and the growth of the medical materials industry has been a change in the function of the pharmacist. Writing in 1929, Fischelis emphasized that the "development of machine production of pharmaceuticals has left its mark on the retail pharmacies in that it has reduced the function of the apothecary in many cases to that of dispensing prepared medicines" (19). The products developed in the subsequent years have accelerated the trend observed by Dr. Fischelis 30 years ago.

The pharmacist is no longer primarily the compounder of powders, ointments, and potions, but the dispenser of prefabricated medicines on prescription. More than 80 percent of all prescriptions sold at present are dispensed rather than compounded (13).

Another consequence has been a sharp increase in prescription practice of the drug store. Prescription volume increased from an average of less than 10 percent of total drug store sales some 30 years ago (7e, 20) to about 30 percent at the present time (21a, b). The average prescription price has increased during that period almost as rapidly as the volume (table 2). Total drug sales, including prescription accessories and packaged medicines,

Table 2. Ratio of prescription volume to total drug store sales and average prescription prices for selected years, 1929, 1931, 1941, 1946-56

| Year ¹ | Ratio of prescription volume to total sales (percent) | Average prescription price |
|-------------------|---|----------------------------|
| 1929----- | 8.5 | \$0.85 |
| 1931----- | 8.1 | .92 |
| 1941----- | 13.2 | .93 |
| 1946----- | 15.8 | 1.33 |
| 1947----- | 16.6 | 1.41 |
| 1948----- | 18.8 | 1.51 |
| 1949----- | 19.0 | 1.60 |
| 1950----- | 20.4 | 1.77 |
| 1951----- | 21.8 | 1.90 |
| 1952----- | 23.7 | 2.08 |
| 1953----- | 24.2 | 2.19 |
| 1954----- | 24.9 | 2.27 |
| 1955----- | 27.3 | 2.46 |
| 1956----- | 29.5 | 2.62 |

¹ SOURCE: For 1929, reference 7e; for 1931, reference 20; and for 1941, reference 21a,b.

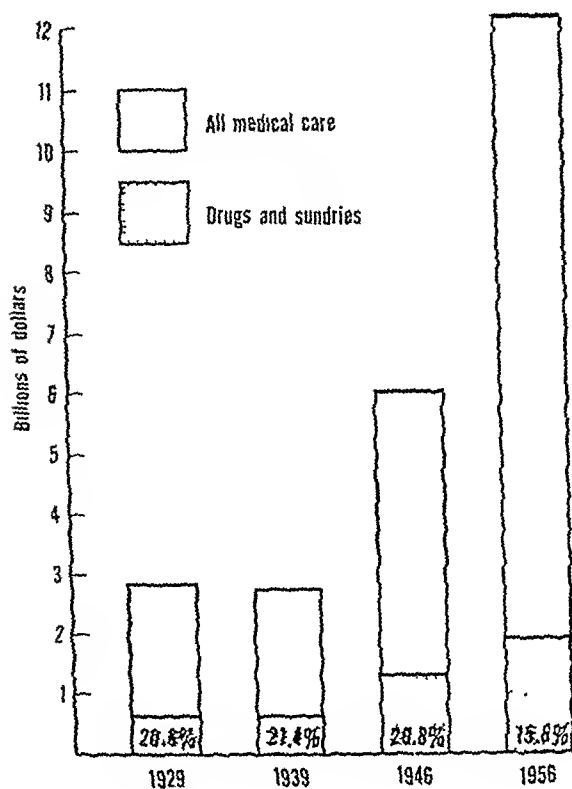
account for about 50 percent of drug store sales (16c).

Total drug store sales in 1929 amounted to \$1,650 million (7b); in 1956 these sales had risen 358 percent to \$5,912 million (16a). During the same period prescription volume grew from about \$140 million (7e) to \$1,466 million (16a), an increase of more than 1,000 percent, almost three times as fast as total drug store sales. Rorem and Fischelis have observed that the index of drug sales volume does not parallel disease incidence, but tends to reflect the level of expendable consumer income (7f).

A third consequence is the increase in the share of drug sales to hospitals. Of an estimated expenditure of \$190 million in 1929 for prescription drugs, hospitals and dispensaries purchased \$25 million, or less than 13 percent; drug stores bought \$140 million, or 74 percent; and physicians accounted for the remaining \$25 million (7g). A recent survey shows that about 24 percent of prescription drugs now goes to hospitals, 56 percent to drug stores, and 20 percent to physicians (12b).

A fourth consequence has been the rise in importance to doctor, pharmacist, and hospital of the "detailman." As a professional service representative in the pharmaceutical

Figure 2. Personal expenditures for drugs and sundries and all medical care for selected years, 1929, 1939, 1946, 1956.



(from 59.3 to 116.2); the medical care index (all items) rose 85 percent (from 71.6 to 132.6); and prescriptions, drugs, and medical supplies rose only 37 percent (from 82.8 to 113.7). Prescriptions, drugs, and supplies make up about 17 percent of all medical care, and medical care about 5.4 percent of all items in the Consumer Price Index.

During the first decade, from 1936 to 1946, the medical care index rose relatively slowly, only one-third above 1936. The rest of its increase, two-thirds, occurred in the second decade, from 1946 to 1956. In the overall 20-year rise, medical care ranked fourth after food, personal care, and apparel.

In the 10-year period from 1946 to 1956, the total medical care index increased to 132.6 as compared with 116.2 for all items (1947-49=100). Within the medical care category are included doctors', surgeons', and dentists' fees, optometric examinations and eyeglasses, hospital room rates, group hospitalization, prescriptions and drugs. Hospital room rates

showed the largest increase, rising to 173.3. Prescriptions and drugs, combined, increased to 113.7. Prescriptions, alone, increased to 121.0, largely as a result of the new drugs. Figure 3 shows the relative increases in total medical care index in the last 10 years, and in prescriptions and drugs particularly. The index of aspirin prices was 125 in 1929 (1947-49=100), fell steadily to 97.6 in 1941, rose to about 100 in 1948, and has remained at more or less the same level since.

The second type of price series represents average prescription prices. Whereas the Bureau of Labor Statistics drug price series measures changes in price for a specified "basket of drug items" selected as of a given period, the average prescription price series reflects changes in the drug item purchased.

The average prescription prices increased from about \$0.85 in 1929 to \$2.62 in 1956, a more than threefold increase (table 2). Average prescription prices in 1956 varied from \$2.49 to \$2.79, according to different surveys. A recent figure for 1957 gives \$2.93 as the average prescription price, the highest on record (16a).

The average price per unit of many of the newer drug types is more than \$3 per prescription. For about 8 of the 26 drug classifications used by the *American Druggist* in its annual prescription survey—classifications accounting for about 54 percent of prescriptions sales in 1956—the average price per prescription was over \$3. In 1957, the figures are even

Table 4. Average amount billed to semiprivate nonmaternity patients utilizing specified hospital services, 1942 and 1952

| Service | Average amount billed | | Percent increase |
|--------------------------|-----------------------|----------|------------------|
| | 1942 | 1952 | |
| Operating room..... | \$10 11 | \$23. 81 | 135 |
| Anesthesia..... | 6. 97 | 15. 79 | 127 |
| Electrocardiogram..... | 8. 56 | 11. 08 | 64 |
| Basal metabolism..... | 6. 76 | 9. 87 | 46 |
| Drugs and dressings..... | 7. 66 | 31. 63 | 313 |
| X-ray..... | 15. 97 | 20. 66 | 29 |
| Laboratory..... | 5. 97 | 18. 02 | 202 |
| Physical therapy..... | 12. 98 | 24. 20 | 86 |
| Oxygen therapy..... | 13. 52 | 38. 59 | 185 |

Source: Reference 26.

was found that 2 percent of the families incurred charges for medicines in excess of \$195 per year (24).

Average family or per capita expenditures for drugs, however, have increased somewhat less than disposable income, that is, family income after taxes. In 1956, \$1,885 million was spent by the Nation's families for drugs, medical supplies, and sundries, exclusive of drugs and dressings used in hospitals or dispensed by physicians. This represents an annual outlay of 0.66 percent of disposable income, or \$35.70 per family and \$11.41 per person. In 1929 personal spending for drugs, medical supplies, and sundries amounted to \$604 million, or 0.73 percent, of disposable income, an expenditure of \$16.73 per family and \$4.96 per person (table 3). During that time disposable personal income increased from \$83.1 billion to \$287.2 billion, an increase of 346 percent; personal spending for drugs, medical supplies, and sundries increased only 312 percent (25a, b, c).

Personal expenditures for drugs, medical supplies, and sundries have increased since 1929 less than medical care generally and less than many items within the medical care component. In part this may reflect higher real incomes of the Nation's families, improved health education, increased use of physician services, and the relative growth of prescribed as compared with nonprescribed drugs. In

part this may reflect the expanded use of hospital care and the relative increase in costs of various services included in hospital care. As a consequence (fig. 2), drugs, medical supplies, and sundries as a personal expenditure represented a smaller part of the personal medical care dollar in 1956 than even 10 years earlier in 1946, or than in 1939 and 1929 (25a, b, c).

Drug costs as a part of hospital costs, however, have risen significantly more than other components of the hospital dollar. The Commission on Financing Hospital Care found that drugs as a percent of hospital costs between 1942 and 1952 had increased more than 300 percent (table 4), a greater increase than any other of the services analyzed (26).

Personal or hospital drug expenditures reflect changes in volume of use of medications, types of drugs used, and price per unit.

There are also data which show only the changes in price per unit, without reflecting volume of prescriptions. Two basic types of price series are available as measures of retail price changes.

The first type is the often-quoted price series compiled by the Bureau of Labor Statistics. According to the Bureau of Labor Statistics Consumer Price Index, a measure of change in the price of specified items customarily purchased by urban wage-earner and clerical-worker families (27), the price index of all items rose 96 percent between 1936 and 1956

Table 3. Disposable personal income, personal spending for medical care, and for drugs and sundries (per capita and per family) for selected years, 1929, 1931, 1939, 1941, 1946, 1951-56

| Year | Disposable personal income (millions) ¹ | Personal medical care expenditures (millions) | Personal expenditures for drugs and sundries | | | | |
|------|--|---|--|------------------------------------|----------------------|------------|------------|
| | | | Total (millions) | Percent disposable personal income | Percent medical care | Per capita | Per family |
| 1929 | \$83, 120 | ² \$2, 937 | ³ \$604 | 0. 73 | 20. 6 | \$4. 96 | \$16. 73 |
| 1931 | 63, 840 | ² 2, 549 | ³ 517 | . 81 | 20. 3 | 4. 17 | 14. 05 |
| 1939 | 70, 444 | ² 2, 848 | ³ 612 | . 87 | 21. 5 | 4. 91 | 14. 96 |
| 1941 | 92, 982 | ² 3, 298 | ³ 725 | . 78 | 22. 0 | 5. 51 | 17. 52 |
| 1946 | 159, 182 | ² 6, 104 | ³ 1, 271 | . 80 | 20. 8 | 9. 18 | 29. 33 |
| 1951 | 226, 069 | ² 8, 780 | ³ 1, 516 | . 67 | 17. 3 | 10. 03 | 30. 61 |
| 1952 | 237, 374 | ² 9, 397 | ³ 1, 569 | . 66 | 16. 7 | 10. 23 | 31. 25 |
| 1953 | 250, 235 | ² 10, 107 | ³ 1, 615 | . 65 | 15. 0 | 10. 35 | 31. 97 |
| 1954 | 254, 463 | ² 10, 603 | ³ 1, 631 | . 64 | 15. 4 | 10. 25 | 31. 89 |
| 1955 | 270, 189 | ² 11, 273 | ³ 1, 747 | . 65 | 15. 5 | 10. 76 | 33. 49 |
| 1956 | 287, 202 | ² 12, 106 | ³ 1, 885 | . 66 | 15. 6 | 11. 41 | 35. 70 |

SOURCES: ¹ Reference 25a. ² Reference 25b. ³ Reference 25c.

ment of hearing. Today \$15 worth of antibiotics clears up most cases without surgery (29c). Syphilis was an important cause of expensive and protracted illness two decades ago. Today, syphilis is often "cured" or at least brought under control with one shot of long-acting penicillin (14). In the United States, penicillin has completely supplanted older forms of therapy such as arsenic and bismuth (30). New drugs, including isoniazid, have helped to reduce deaths from tuberculosis. Between 1946 and 1955 the tuberculosis death rate dropped from 34.9 per 100,000 to 9.1 per 100,000, a decrease of almost 75 percent (2). Many patients are now cured at home in a small fraction of the time, and the cost, it took when prolonged rest in a sanatorium was the major technique.

Volume of Prescription Pharmaceuticals

A recent guide to the sales and status of the drug market warns the reader, "Before using this book, we suggest that you rid yourself of all old conceptions of the magnitude of the volume of manufacturers' sales of ethically promoted pharmaceuticals for human use. Otherwise today's figures will seem fantastic. Times have changed. We sometimes look back with nostalgia to 1929 when the manufacturers' sales amounted to about \$250 million. Think now of sales in manufacturers' dollars of nearly \$6 for each and every one of 165 million persons in the United States!" (12c).

From 1929 to 1955, then, the sales volume of manufactured prescription pharmaceuticals almost quadrupled, from \$250 million to \$990 million. Current trends show sales to be considerably higher.

In a recent speech before the 61st Annual Conference of Food and Drug Officials of the United States, an official of one of the major drug laboratories said that 10 leading drug houses alone, in their 1956 annual reports, showed sales that ranged from \$100 million to \$200 million (31).

One drug company reports sales in 1957 of \$207 million as compared with its 1956 sales of \$178 million (32). Its 1958 sales for the first quarter were \$54 million as compared with \$51 million in 1957; its 1958 earnings for the same

period were \$6½ million, 19 percent above 1957 and a record high (33).

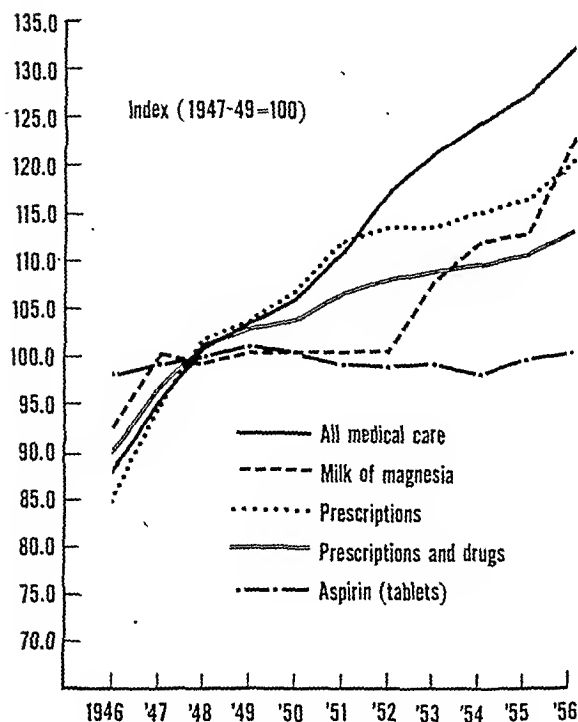
The manufacture of prescription pharmaceuticals is now well over a \$2 billion industry. The increased volume of wholesale drug sales is of course reflected in the increased retail prescription volume.

An industry publication, in its Silver Anniversary issue, stated: "Drug store sales volume in 1956 was the highest ever recorded" (21c). In an 11-year period the number of prescription sales increased by 50 percent and the income from prescriptions tripled, largely because of increase in average prescription prices, but to some extent from an increase in the number of prescriptions dispensed (21d). "The 11-year rise in average prescription prices is due to the tremendous increase in the widespread use of new therapeutic agents, virtually all of which are costly to dispense." (21b).

Summary

The nature of the drug industry has changed in the last 30 years. With it has changed the manpower in the industry and the pharmacist's role—from a compounder to a dispenser of drugs. The increased number of drugs and their complexities have intensified his services as drug therapy consultant to physicians and dentists. The basic sources and compounding of pharmaceuticals have changed in character, and have increasingly become the object of intensive research by both private and public organizations in the effort to develop specific drugs for specific illnesses. The dosage and dosage forms have become more concentrated and standardized, generally in tablet form. Drugs represent a decreasing proportion of the medical care dollar and of disposable income. The price of drugs generally has been high for new items, falling with volume use and production, or obsolescence. Average price per prescription has doubled since 1946 and more than tripled since 1929. The length of some illnesses has been shortened by the development of specific therapies, and the cost has been cut even though drugs are more expensive. The volume of manufactured prescription pharmaceuticals increased from \$250 million in 1929 to more than \$2 billion in 1956, a tenfold increase in

Figure 3. Consumer price indexes for medical care items, annual averages.



more revealing. Table 5 shows that 8 of the 26 classifications accounted for 60 percent of the dollar value of prescriptions; all averaged more than \$3 per prescription, and two more than \$4 (16a, d).

Prices of new drugs follow a characteristic pattern of decline after initial introduction, and when volume use and production take place. Penicillin in 1943 sold for \$20 per 100,000 units in injectable form. In 1956, it sold for \$0.20 per 100,000 units in tablet form, a drop of 99 percent (28a, 29a). Since its introduction in 1950, cortisone has dropped 90 percent in price (15). Within 2 years of its introduction cortisone fell from \$200 per gram when made from animal bile to \$50 when made from yams and other plants (28a). Streptomycin dropped 40 percent in less than a year (13). Insulin now costs about 6 percent of what it did 30 years ago, shortly after it was introduced (28b).

The downward movement in prices of new drugs is a brake on the prescription price index. However, this type of price index is also influenced by the distribution of prescriptions among different kinds of drugs, as well as by

the rapid obsolescence of drug items and their continuous replacement by newer, more effective, and, at original issue, more expensive drugs.

Drug and Illness Costs

The cost of medicines may also be viewed as a part of the cost of illness. As indicated earlier the percent of the personal medical dollar going to drugs, medical supplies, and sundries has declined. In terms of specific illnesses drug costs have risen sharply but have been instrumental in reducing the total medical outlays and in shortening hospital stays and time loss from productive activity.

According to one source, 20 years ago a case of lobar pneumonia meant 5 weeks in a hospital, long convalescence, and \$300 to \$400 for doctors, nurses, medicine, oxygen, and hospital care. Today it means 2 weeks of illness, generally at home, back to work immediately thereafter, and \$15 to \$30 for drugs (29b).

Thirty years ago the treatment of mastoiditis cost at least \$1,000, required surgery, and involved the possibility of permanent impair-

Table 5. Comparison of selected prescription types by percent of total dollar value of all prescriptions sold, and average price, for 1956 and 1957

| Prescription type | Percent of total dollar value | | Average price | |
|---------------------------|-------------------------------|-------|---------------|--------|
| | 1956 | 1957 | 1956 | 1957 |
| Anti-infectives..... | 24.1 | 25.4 | \$3.68 | \$4.03 |
| Sedatives..... | 14.5 | 15.2 | 2.86 | 3.01 |
| Cardiovasculars..... | 9.3 | 6.8 | 3.20 | 2.91 |
| Anti-arthritis..... | 6.0 | 5.4 | 4.16 | 1.10 |
| Stimulants..... | 3.9 | 4.1 | 3.05 | 3.23 |
| Hematinics..... | 4.0 | 3.5 | 3.62 | 3.52 |
| Sex hormones..... | 2.4 | 2.1 | 3.15 | 3.26 |
| Therapeutic vitamins..... | 2.3 | 2.5 | 3.16 | 3.31 |
| Preventive vitamins..... | 1.9 | 1.7 | 3.11 | 3.19 |
| Other types..... | 46.1 | 10.1 | | |
| Total..... | 100.0 | 100.0 | | |

SOURCE: References 16a, d.

NOTE: The italicized figures are not included in the totals, for the year involved. Thus the number of specific prescription types listed is 8 in both 1956 and 1957. Sedatives were less than \$3 in 1956, hence not included for that year; cardiovasculars were less than \$3 in 1957, hence not included for that year.

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Interstate Shipment of Milk

Ban on out-of-state milk, unless produced and handled under conditions no less adequate in protection of public health than milk produced in State upheld. *James v. Todd*, 103 So. 2d 19 (Alabama, Aug. 22, 1957).

A declaratory judgment of the Supreme Court of Alabama has upheld the validity of an Alabama statute (Act No. 570, 1955 Acts) prohibiting the shipment of milk into Alabama from another State "unless such milk is produced and handled under sanitary conditions no less adequate in protection of public health than milk produced in the State of Alabama," and authorizing the State Commissioner of Agriculture and Industries to inspect the conditions under which out-of-state milk was produced and to issue and revoke permits for transportation of such milk into Alabama.

After citing *Milk Control Board of Pennsylvania v. Eisenberg Farm Products*, 306 U. S. 346, 59 S. Ct. 528 as evidencing recognition by the Supreme Court of the United States that the milk business is essentially local and, therefore, subject to the police power of the State, the Alabama court stated:

"Under its police power, the State of Alabama is authorized to enact laws designed to protect the health of its citizens and more particularly where milk is concerned because of its nutritional importance to human beings and because of its susceptibility to contamination. . . . The Legislature may even grant to a municipality the power to provide health regulations."

The mere fact that the statute was applicable only to out-of-state milk did not, the court held, constitute an unreasonable discrimina-

tion or a burden on interstate commerce. The validity of the statute was, however, held to depend on whether it was a reasonable system established as a safeguard of the public health or a system calculated to prevent the importation of out-of-state milk in competition with local supplies. The court distinguished *Dean Milk Co. v. City of Madison*, 340 U. S. 349 (where the appellant was denied a license to sell milk in the city because its plant was more than 5 miles away), and other related cases, on the ground that those cases dealt with the administration or enforcement of statutes which in operation "made it practically impossible to import . . . goods into the State."

While the court conceded that in the administration of the Alabama Act there was a possibility of abuses such as would raise a question of its constitutionality, it concluded that the statute, on its face, was reasonably related to the protection of the public health and was not intended to prevent the importation of out-of-state milk in order to eliminate competition with local supplies.

The court warned, however, that enforcement of the statute under a construction (supportable under the literal language of the act) which would limit permits to shippers of milk, and hence exclude milk from out-of-state producers who were not also shippers, would be unconstitutional.

less than 30 years. The volume of retail prescriptions has increased during that period, from \$140 million to \$1,466 million.

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Occupational Health at a University

GEORGE S. MICHAELSEN, M.S.

OCCUPATIONAL HEALTH programs of official agencies have rather consistently overlooked the college as an area where preventive occupational health work could be profitably carried on.

There may be several reasons for this. Perhaps one is that these agencies have been so industry-oriented that they have overlooked the academic staff, other employees, and students of the larger colleges and universities as industrial or occupational groups with which to work. Another reason could well be the prevailing misconception that chemists, physicists, bacteriologists, engineers, and other similar professionally trained people know the potential health hazards of the materials and processes they use. The assumption follows that they also take the necessary precautions to protect themselves.

I can assure you, after working for several years with such professionally skilled personnel, this is definitely not so. Some well-informed persons are outstanding in the real concern they show for their own health and safety as well as that of their colleagues and assistants. But most have not sought information about possible health hazards in their work. I must add, however, that I have found academicians without exception to be a most receptive and interested group ready to accept the

facts and willing to cooperate in instituting corrective measures.

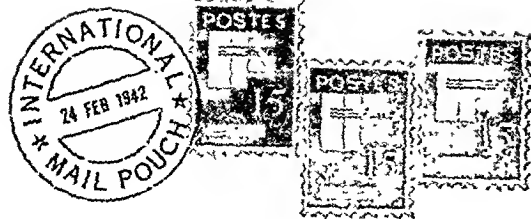
Even though our sights are gradually lifting from the strictly industrial to the broader concept of occupational health, the colleges and universities are still being overlooked. Generally, the administrative heads of colleges and universities fail to recognize that the campuses have occupational health hazards and often dangerous situations.

Sponsored research, both basic and applied, is now a multimillion dollar business for colleges and universities, vastly increasing research activities and staffs. At present many scientists are employed solely for research. They have no teaching responsibilities even though they are members of the academic staff. Their laboratories are no different from those in the research department of a large industry.

Campus Health Hazards

A large university campus has all the health hazards of industry and frequently some which have not yet reached the industrial stage. The latter hazards are the most troublesome to the occupational health engineer on the campus. Many times he can make only a wild guess as to the toxic properties of the materials being used, and in such cases he is inclined to be very conservative. At the same time he must not be so stringent in his control measures that it becomes virtually impossible to carry out the research project. To date, such problems at the University of Minnesota predominantly have concerned new agricultural chemicals and the resistance of various materials to chemical action at high temperatures and pressures.

Mr. Michaelsen is associate professor, School of Public Health, and industrial health engineer, university health service, at the University of Minnesota in Minneapolis. This article is based upon a paper presented at the 20th annual meeting of the American Conference of Governmental Industrial Hygienists at Atlantic City, N. J., April 21, 1958.



Public Health Dentistry

The School of Hygiene and Public Health at the University of São Paulo is now training dentists to administer dental public health programs in Latin America. The course of study, leading to a degree equivalent to master of public health, is the first such course in Brazil.

Sixteen dentists, half of them studying under World Health Organization fellowships, enrolled in the course in February 1958. They come from Argentina, Brazil, Colombia, Costa Rica, El Salvador, Paraguay, Peru, and the Dominican Republic.

They study general public health subjects with physicians, veterinarians, and engineers. Separate classes on specific dental subjects include refresher courses in dental techniques, current information and methods in caries prevention, and technical guidance during field work.

Several agencies are cooperating with the university in this course. WHO provides advisory services, fellowships, and teaching materials; the Kellogg Foundation gives financial aid, equipment, and supplies; and Serviço Especial de Saúde Pública participates in the students' field training.

—ALFREDO REIS VIEGAS, D.D.S., M.P.H., *assistant professor, School of Hygiene and Public Health, University of São Paulo, Brazil.*

Typhus Among the Araucanians

In Cautín Province, Chile, where the National Health Service has battled classic louseborne typhus fever for several years, are some 150,000 Araucanian Indians, the people celebrated in Ercilla's epic poem, "La Araucana."

The Araucanians live primitively in *rucas*, or huts, much as they did when they successfully withstood for hundreds of years both Inca and Spanish conquest. Their huts are scattered singly and in three's and four's over a wide area, and they travel long

distances on foot, horseback, or by oxcart. But their custom of attending funerals in extraordinarily large numbers has helped to spread typhus, which they carry back to their home areas after these gatherings.

We visited the central Chilean province, which has an endemic focus of typhus, to get first-hand information after the National Health Service asked for help in eradicating the disease. The area where most work is needed is impassable to motor vehicles 9 months of the year, and only jeeps can be used the other 3 months. Nevertheless, we hope to start a combined disinfection and typhus vaccination campaign the latter part of 1958.

—G. HOWARD GOWEN, M.D., *chief, Health and Sanitation Division, U. S. Operations Mission, Chile.*

The Mountain People

The way of life of the mountain people in the Philippines makes it difficult for malaria eradication teams to protect them from the disease. Dissident and evasive with lowlanders, the mountaineers are hard to reach. Distribution of a drug-salt mixture is planned.

The mountain people withdraw from the settlements and follow their own customs in remote, high, forested areas. Some grow mountain rice and sweet potatoes on cleared plots which they abandon after a year or two. Others simply gather the food nature provides. Houses may be nonexistent, or tree dwellings, or roofed platforms, or permanent structures.

Practically all such groups have been found to be malarial to some degree and thus are reservoirs of infection. Intermittently, the mountain people come to the settlements to trade for salt or other articles or to work as itinerant farm laborers. This influx of chronically infected people causes continual transmission.

Malaria among the mountaineers has helped to disprove the assumption that malaria cannot be transmitted at heights above 2,000 feet, because of the habits of the principal vector, *Anopheles minimus flavirostris*. Several other anophelines, whose habitats extend to 3,300 or even 5,500 feet, have been incriminated by anopheline dissection.

—JOHN W. McDOWELL, *malaria control adviser, U. S. Operations Mission, Republic of the Philippines.*

The bulk of the instruction is carried out on the three campuses. There are also 5 agricultural experimental stations and schools in outlying parts of the State; an 8,000-acre center for all types of research 25 miles south of the Minneapolis campus; a 2,000-acre wildlife preserve 25 miles north of the St. Paul campus for research on wildlife, forests, lakes, and streams; and a number of smaller stations and research facilities.

Three factors of the division's administrative arrangement we feel are highly desirable. First, the occupational health engineer is a part of a professional team. Close association with the radiological health and safety personnel is particularly helpful to him because occupational health problems frequently involve these fields. Occupational health and safety are very closely allied; in fact, it is often difficult to distinguish between them. Having specialists in both these fields on the same team rather than in different departments, where overlapping activities and contradictory recommendations might occur, is especially advantageous.

For example, the safety engineer was asked to consider the safety hazards of using solvents in a cryostat, a refrigerated, box-like apparatus employed to carry out laboratory procedures at extremely low temperatures. The operator uses insulated gloves mounted in the wall of the apparatus. Neither the motor-driven fan nor the electric lights inside it are explosion proof. From a safety standpoint, it would be hazardous to use solvents in this cabinet unless the temperature is maintained at all times below the flashpoint of the solvent. From an occupational health standpoint, the cryostat is a good device since the hazardous operation is fully enclosed.

The safety engineer is inclined to recommend that this work be done in a large walk-in freezer where it would be virtually impossible to create an explosive mixture. The occupational health engineer is inclined to veto this recommendation because of the dangers of inhaling solvents in a confined, unventilated space.

In this case, the conflicting interests were worked out by agreeing not to use solvents with combustible vapors in cryostats and by providing adequate ventilation in the walk-in freezers. If these two engineers had been in

different departments, such a compromise might have been made only after some misunderstanding and delay. In our case the conflict was resolved in minutes.

A second strong feature of the administrative plan is the academic appointments with teaching responsibilities of our staff members. Teaching occupational health forces us to be aware of all new developments, and working in an operating program provides us with a wealth of illustrations, examples, and demonstrations to use in the classroom.

The third feature is the division's close association with the medical staff of the health service which serves the staff and students. The medical staff members are alert to possible environmental factors of illnesses that come to their attention. For example, a student with severe headaches came to a staff physician. After detailed questioning, the physician was satisfied that the headaches were associated with the home environment. The occupational health engineer found 400 ppm carbon monoxide in the flue gases being discharged into the student's apartment by a gas refrigerator.

Several mercury and solvent hazard studies have been initiated at the request of physicians who have suspected such poisoning in students and laboratory workers seeking medical attention. The results of a survey of occupational health hazards on the campus have enabled the industrial health engineer and the physicians to advise the university's civil service department on the proper placement of a maintenance worker who suffers from certain specific allergies. Such requests for assistance and referral of problems would not be as frequent if the occupational health engineer and the physician were not in the same department.

A university occupational health program has all the usual elements of prevention, including preplacement and periodic physical examinations, evaluations of possible occupational health hazards, and recommendations for the corrections needed.

Survey of Hazards

One of its most profitable phases is a room-by-room survey of the entire campus for occupational health hazards. The broad activ-

Some idea of the variety and types of occupational health hazards on a college or university campus is indicated by this partial list of those that have occurred at the University of Minnesota in recent years:

- The sergeant in charge of the armory rifle range became ill with lead poisoning. Air sampling revealed atmospheric lead concentrations many times the maximum allowable concentration although only a portion of the range was used. Installation of an extensive ventilating system corrected this hazard.

- Scientists working on particle-size measurement were being overexposed to benzol in a filter cleaning operation. The use of local exhaust ventilation eliminated this hazard.

- Lead and solvent hazards have been studied in the print shop.

- The dangers of welding fumes have been eliminated from the maintenance shops.

- The carbon monoxide content of the air in the university's underground garages has been measured during periods of heavy usage.

- Excessive noise in wind tunnel, in jet engine testing, and in jet fuel combustion research has been evaluated.

- The mercury hazard has been studied in scores of laboratories.

- The misuse of carbon tetrachloride is campuswide and is being studied.

- Potential dangers in handling organic, phosphate-type insecticides in laboratory, greenhouse, and field have been studied.

In most of these problems only a few persons were exposed, which may be somewhat different from the industrial situation. Seldom are exposures to students great enough to cause actual poisoning or impairment of health, but control measures are instituted to alert students to potential hazards and to teach them what control measures are necessary in industry.

Although several institutions have teaching programs in occupational health, so far as I know, only the University of California, the Massachusetts Institute of Technology, and the University of Minnesota have operating functions in this field. Each of these three has a slightly different administrative pattern, undoubtedly dictated by the local situation. Colleges teaching occupational health may give

some service within their institutions when called upon, but in general they have no specific responsibility for the control of occupational disease hazards on their campuses.

University Health Service

The University of Minnesota is an autonomous branch of the State government, and all matters of health on its various campuses are a responsibility of the university health service. The Minnesota State Board of Health has therefore officially designated the university health service as a local health department; it is an independent service administratively under the academic vice-president.

The service's division of environmental health and safety was created to cope with the health aspects of water supply, waste disposal, food handling, student housing, swimming pools, radiological health, safety, and occupational hazards. On the staff of the division full time are 1 public health engineer, 1 occupational health engineer, 1 safety engineer, 3 health physicists, and 2 sanitarians, and part time, 2 engineers and a sanitarian. The full-time staff members also have academic appointments in the School of Public Health. This staff may seem large, but considering the size and geographic spread of the institution, it may be too small.

For a program with a wide scope of activities, it is highly desirable to have one or more physicians either on the occupational health staff or closely associated with it. At the University of Minnesota one of the health service physicians is assigned to give special attention to occupational diseases and to medical problems associated with exposure to ionizing radiation.

The University of Minnesota has the second largest enrollment of full-time students in the country, exceeded only by the University of California. In the fall of 1957 about 35,000 students were enrolled on the Minneapolis, St. Paul, and Duluth campuses and an estimated 90,000 a year in all forms of instruction—day, night, and extension classes and correspondence courses. To serve the student body the university employs about 10,000 people, 3,500 of these full-time academic staff members.

Progress in Reporting Mental Hospital Statistics

*Eighth Annual Conference of
Mental Hospital Statisticians
Sacramento, Calif., May 7-9, 1958*

A CAREFUL REVIEW and revision of definitions of terms describing the movement of mental hospital patients, refinement of cohort studies of admissions to mental hospitals, and a study of the socioeconomic characteristics of admissions to facilities for the mentally ill in relation to corresponding characteristics of the general population were major topics discussed at the Eighth Annual Conference of Mental Hospital Statisticians.

The conference, held in Sacramento, Calif., May 7-9, 1958, was sponsored by the National Institute of Mental Health, National Institutes of Health, Public Health Service. In attendance were delegates from 19 of the 20 States which are members of the Model Reporting Area for Mental Hospital Statistics (see box insert).

Observers from Massachusetts, Oregon, South Carolina, and Tennessee, and from the Veterans Administration were also present. Other guests represented Great Britain's General Register Office, Canada's Bureau of Statistics, the American Association on Mental Deficiency, the Joint Information Service of the American Psychiatric Association and the National Association for Mental Health, the Mental Health Project of the Western Interstate

Commission for Higher Education, and the Public Health Service office of Region IX.

Revision of Definitions

Uniform definitions of basic terms describing the movement of mental hospital populations have been in use by the members of the Model Reporting Area since 1952. While the use of these definitions has resulted in a greater degree of interstate comparability of data based on them, statisticians have found that these definitions lead to inconsistencies both within and between States. Consequently, a committee on definitions, appointed at the Seventh Annual Conference, recommended several changes, the most notable of which pertained to the definitions of first admission and transfer.

Until now, a first admission was defined as a patient who had not previously been admitted to a public or nonpublic hospital authorized or recognized for the treatment of mental disorders. Public hospitals include those operated by a State, city, county, or Federal agency. Nonpublic hospitals include those authorized or recognized for the treatment of mental disorders by a State mental hospital authority. The committee recommended that since there is considerable variation in the criteria used by these authorities in determining authorized or recognized hospitals it would be more appropriate to classify admissions by their type of previous hospitalization for mental disorders. The following classification of admissions to public mental hospitals was proposed by the committee and accepted by the conference:

This report was prepared by the Hospital Studies Section, Biometrics Branch, National Institute of Mental Health, Public Health Service, Bethesda, Md. For a short account of the establishment and objectives of the Model Reporting Area referred to in this report, see Public Health Reports, October 1956, p. 1033.

ities of the division of environmental health and safety mean we survey much more than the usual hazards. We include the following areas:

Fire and accident prevention. Adequate provision of gas masks, protective clothing, fire blankets, safety showers, illumination, first aid kits, and fire extinguishers.

General sanitation. Availability of eating accommodations and building incinerators, insect and rodent control, plumbing defects, and refuse disposal.

Animal care. Types of animals used, source of supply, isolation procedures, evidence of ectoparasites, cage cleaning methods, type of bedding, and disposal of solid wastes and dead animals.

Radiation hazards. X-ray machines, sealed or unsealed radionuclides, and other sources of ionizing radiation.

Building safety. Adequate exits, handrails, and stairways; guarding of machinery; grounding of electrical equipment; and the handling, storage, and disposal of flammable solvents.

The survey provides an unusual opportunity for the occupational health engineer to get acquainted with the institution and for the various branches of the university to become familiar with this health service function.

The occupational health engineer also reviews all plans for new buildings and major remodeling of older buildings at the university. At present, 48 such projects are in various stages of planning and building. These pro-

vide him with an unusual opportunity to recommend the proper ventilation to protect the health and welfare of the occupants, to review the need for process or special ventilation, hoods, safety showers, and fire extinguishers, and to check for adequate means of egress. The occupational health engineer also serves as consultant to the space allocations committee of the university, advising on health and safety considerations in the assignment of building space for various shops and research projects.

If it is to serve to its fullest capacity, a university occupational health program must be concerned with problems beyond those considered strictly health matters such as fire prevention and disposal of solid and liquid wastes which are combustible or toxic or both. The occupational health staff does not necessarily have to operate such programs, but should have an intimate working relationship with the persons responsible.

In other institutions where environmental health is not interpreted as broadly as at the University of Minnesota, to establish close-working relationships between the occupational health personnel and those responsible for other environmental problems would be highly advantageous. I urge those of you in the occupational health programs of government agencies to visit the colleges and universities in your area and offer to survey their facilities for occupational health hazards. You will find that you can assist them with a number of problems and you may find that they can help you with some of yours.

of released patients to determine the probability of their return to the hospital within specified periods of time following release. The conference members agreed that each State should submit a protocol of cohort studies which it is conducting or plans to conduct. A committee will then review these protocols and prepare a study design, conforming to the four criteria above, which could be carried out by as many of the States as possible. Such a protocol would be presented for consideration at the next annual conference.

Socioeconomic Studies

The possibility was discussed of conducting studies which would relate the socioeconomic characteristics of patients admitted to psychiatric facilities to those of the general population, as revealed by the 1960 population census. The primary objective would be to determine the extent to which various socioeconomic groups use the different psychiatric treatment facilities within a State.

It was hoped that some States would study the socioeconomic characteristics of those admitted to all types of psychiatric facilities and that other States might at least carry out more limited studies on patients admitted to only specific facilities, such as public mental hospitals.

One important aspect of the proposed socioeconomic study is the acquisition of basic information about each member of the patient's family. Similar data about the general population is obtainable from the Bureau of the Census. With these two sets of data, one may analyze family composition in relation to admissions to psychiatric facilities and determine rates of admission among families with specified characteristics.

Death Rates

Preliminary findings of a study of deaths among mental hospital populations were presented. This study was based on data submitted by the Model Reporting Area States in 1955. It compared age-specific and age-adjusted death rates from various causes among mental hospital populations in specific

diagnostic categories with corresponding rates for the general population. The data indicated that the death rates were considerably higher in the hospital populations than in the corresponding general populations.

One of the major difficulties this study faced was the choice of a suitable denominator for the computation of hospital death rates. Two types of rates were computed: a central rate using the average number of resident patients as a denominator, and a terminal rate using an estimate of the number of patients under treatment during the year as a denominator. Each of these rates answers a slightly different question. The most serious disadvantage of the central rate is that in certain patient groups it could exceed unity. The disadvantage of the terminal rate is that the reporting of data on the annual movement of populations in mental hospitals is not sufficiently complete to provide an adequate count of the number of patients under treatment during the year.

A new study of mental hospital death rates was therefore proposed which would be conducted during a period centered around the 1960 population census. Attention would be focused on only certain mental diagnostic groups and certain causes of death, and data would be collected over a 3-year period to insure stability of the resulting rates. Representatives of several States expressed interest in this study and it was agreed that details would be worked out during the year.

Statistics in Canada and Great Britain

Delegates from Great Britain and Canada described their mental health statistics programs and compared their problems with those in the Model Reporting Area. They expressed the desire to obtain international comparability of mental health statistics, but it was generally agreed that the first step will be to obtain comparability within each country.

Other Problems

In view of the interest in staffing patterns of mental hospitals, the conference recommended that the forms currently used for reporting personnel data be revised so as to include fewer

1. No prior admission to any inpatient psychiatric facility.

2. Prior admission to an inpatient psychiatric facility in the State system, to which the patient is now being admitted, in the following categories: (a) State and county hospitals, (b) institutions for the mentally defective, and (c) psychopathic hospitals.

3. Prior admission to other inpatient facilities as follows: (a) State psychiatric facility in other States, (b) Veterans Administration hospitals, (c) private mental hospitals, and (d) all other inpatient psychiatric facilities, including psychiatric services of general hospitals.

Under this definition, patients who have until now been considered first admissions because their inpatient experience occurred in hospitals not listed in the register will be classified as having had prior admissions to such hospitals. This definition will provide a greater amount of information than the current one and will permit a more meaningful comparison of admissions to the State mental hospital systems.

The committee on definitions also proposed that the definition of "transfer" be revised to take into account the increasing interchange of patients between hospitals for the mentally ill and institutions for the mentally defective. Transfers would continue to be defined as movements of patients between hospitals within a single State system without a break in custody, but the State system would be redefined to include public mental hospitals (exclusive of Veterans Administration hospitals) and public institutions for mental defectives within the State. This proposal was also approved by the conference.

Model Reporting Area States

Representatives from the following States are members of the Model Reporting Area for Mental Hospital Statistics.

| | | |
|-------------|------------|--------------|
| Arkansas | Louisiana | Oklahoma |
| California | Michigan | Pennsylvania |
| Connecticut | Minnesota | Texas |
| Illinois | Nebraska | Virginia |
| Indiana | New Jersey | Washington |
| Kansas | New York | Wisconsin |
| Kentucky | Ohio | |

Cohort Studies

Eleven of the States in the Model Reporting Area submitted data showing the proportion of patients released from, dying in, or retained continuously in public mental hospitals within the first 12 months following admission. Based on these data and on statements submitted by each of the 11 States concerning the laws, policies, and other factors which may affect admission or release from the public mental hospitals in their States, a draft of a monograph was presented at the conference for discussion.

The monograph had four major objectives: first, to illustrate the mechanics and difficulties of conducting a study that requires careful definitions and analysis and the cooperation of 11 independent governmental organizations, widely separated geographically; second, to present data on the probabilities of release, death in the hospital, or continuous residence in the hospital for specified periods of time following first admission in different State mental hospital systems; third, to discuss the problems in interpreting interstate comparisons of these data; and fourth, to delineate the types of data, methodology, and special studies needed to obtain more meaningful interstate comparisons. Thus, considerable emphasis was placed in the monograph on the limitations of the data and the problems inherent in their interpretation.

The conference members agreed that the monograph would be a valuable reference for people working in the mental hospital field, that the draft be submitted for approval to the commissioners of mental hygiene of the 11 States, and that it be published as soon as possible.

A proposal was presented to the conference for a more detailed cohort study in which members of the Model Reporting Area might participate. Based on the experience gained in the monograph study, the cohort research would involve: (a) a more precise definition of the starting cohort in terms of previous psychiatric care, type of commitment, and date of admission; (b) stratification of patients in the cohort by marital status, age, sex, mental diagnosis, and urban and rural residence; (c) development of specific criteria for classification of patients at time of release; and (d) followup

Concepts in the Prevention of Hepatitis

The following remarks on hepatitis are quoted from a panel discussion in the Proceedings of the Third Conference of the Industrial Council for Tropical Health, April 16-17, 1957, published by the Harvard School of Public Health this year.

DR. GEOFFREY EDSALL: I did not get a clear picture with regard to our working concepts of the prevention of hepatitis. I know perfectly well that any working concepts, other than the waterborne outbreak in Delhi and a few other similar bits of evidence, might be just as vulnerable as some of the theories and practices that Dr. Thomas C. Chalmers outlined. But for something to go away with, I would like to propose this if only in order to see it knocked down: Assuming the control of hepatitis is essentially identical with the control of dysentery—that is, putting it in the simplest possible language, if it were a fecal disease, transmitted by water and other related mechanisms—could it be prevented by exactly the same types of sanitary approaches? I have stated this arbitrarily, in order to provide a target, and I would be interested in the comments of the panel.

DR. JOHN R. PAUL: I wish I could dispose of this in a few plain words. Let us assume that the same principle may be followed. There are, however, a number of points that might be different. For instance, you mentioned the epidemic in Delhi, India, where a member of our department was fortunate enough to be present. This alert person in the water supply division realized that sewage was getting into the water supply, so he did all the things he knew to prevent a catastrophe; namely, he stepped up the chlorine to—I can't give you the figures—levels which normally should take care of bacterial infections. I'm not sure that it would take care of everything, but this was singularly effective, it would seem, in preventing any outbreaks of dysentery and typhoid in the city.

Anyway, the water supply suddenly had be-

come 50 percent sewage. The chlorination was effective in that there were no outbreaks of typhoid fever, but was singularly ineffective in preventing hepatitis. It would seem as if this high percentage of chlorine had killed off most pathogens, if not all of them, but had not a lethal effect on hepatitis virus.

The other feature that might possibly be emphasized, in which this might differ from the control of the enteric diseases we mentioned before, is that this is a virus highly resistant to heat. When it comes to boiling water or washing utensils or cleaning mess kits, my guess—although no better than anyone else's—is that it does seem that a little more vigorous heat treatment seems to be indicated than would normally take care of other agents.

DR. EDSALL: I am glad you brought out the quantitative differences. I didn't phrase my statement right. The qualitative differences were the same, but as you pointed out, quantitatively we are dealing with a much tougher agent to kill.

DR. RODNEY A. YOELL: Some of this has undoubtedly arisen or originated from the practice of doctors who give vaccinations for travel agencies. They use the multiple-dose vaccine. In other words, they buy the 10-dose typhoid and 10-dose cholera in bottles. I checked up about 20 of them, and only 3 were autoclaving their needles. I am wondering if something couldn't be put in the serum or vaccine as a warning or a preventive. Apparently it gets into the vaccine and stays there, because these people get vaccinated, then they come to San Francisco, and just before they get to Japan, they have the virus.

CHAIRMAN JOHN C. SNYDER: I think you have called attention to the importance of adequate heat sterilization, and this really deserves emphasis. I am sure that there are numerous examples that all of us could draw upon, pointing up this feature.

and more specific categories of personnel and data on turnover of personnel which would show the number employed at the beginning of a year, the number added during the year, the number leaving employment during the year, and the number employed at the end of the year. It was further proposed that State personnel officers assist in formulating the necessary classifications and definitions.

Statisticians find that interpreting interstate comparisons of expenditure data is complicated by differences in accounting procedures among States. For this reason, a committee was appointed to work with State finance officers and the Council of State Governments, which is also considerably interested in clarifying this matter in order to develop more meaningful reporting of expenditure data.

In a discussion of the interpretation of trends in the population movement of public mental hospitals, it was pointed out that existing data on population movement do not indicate the specific groups of patients in which changes are occurring, nor do they permit an analysis of changes in relation to possible causative factors.

With this as background, a proposed form was examined for the annual reporting of

population movement according to age, sex, length of hospital stay, and two diagnostic groups: schizophrenia and diseases of the senium. This form permits an analysis of changes in population movement within groups defined simultaneously by the four variables. While some of the representatives indicated that these tabulations would require changes in their existing procedures, most of them agreed to prepare them on a trial basis after certain modifications in the form had been made.

Regional Meetings

A report was given covering the proceedings of the Third Midwest Conference on Mental Health Statistics, held in Lansing, Mich., on October 2 and 3, 1957. The first three meetings of this group were aimed primarily at developing interstate comparability of mental hospital data in the midwest. At the third meeting it was suggested that it would be desirable to conduct some small-scale research projects on a regional basis. Accordingly, a committee was appointed to develop suggestions for such projects and to present these plans at the next meeting of the group in October 1958.

CDC Courses in Environmental Health

The following courses in environmental health will be offered at the Communicable Disease Center, Atlanta, Ga., during 1958-59:

Epidemiology and control of milkborne diseases. October 20-24. Review of epidemiology, emphasizing its use in the control of milkborne diseases. Epidemiology problems will be presented to the class for solution.

Milk pasteurization controls. November 12-14. Instruction in principles and control of milk pasteurization and demonstration of testing procedures, with the class responsible for the testing. Fieldwork will be performed on full-scale operating equipment.

Milk sanitation—operational. February 9-20. Comprehensive coverage of health and sanitation problems in the safe handling of milk and milk products, designed for public health personnel administering such programs.

Epidemiology and control of foodborne diseases. May 25-29. A multidiscipline course emphasizing epidemiological principles in the control of foodborne diseases. The class will work in groups and use a team approach to solve an epidemiological problem.

No tuition or fees will be charged for these courses. Priorities for admittance must be restricted to qualified personnel because the size of each class is limited. All applications must be received at least 2 weeks before the course begins.

Application blanks and further information may be obtained through local and State health departments, Public Health Service regional offices, or by writing to Chief, Communicable Disease Center, Public Health Service, 50 Seventh Street, N. E., Atlanta 23, Ga.

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CHAIRMAN JOHN C. SNYDER: I think you have called attention to the importance of adequate heat sterilization, and this really deserves emphasis. I am sure that there are numerous examples that all of us could draw upon, pointing up this feature.

Reflecting the profound changes in therapy of the past decade, treatment of tuberculosis patients is shifting from the specialized to the general hospital. According to a VA physician, the trend is to be encouraged, for general hospital treatment not only is feasible but may be conducive to improved care.

Treatment of Tuberculosis in a General Hospital

WILLIAM B. TUCKER, M.D.

FOR ABOUT 75 years tuberculosis patients requiring hospital treatment have received care primarily in hospitals specializing in the treatment of this disease, usually designated as sanatoriums. As the result of the impetus given the sanatorium movement in the Adirondacks, by Dr. Edward Livingston Trudeau, the public came to associate treatment of tuberculosis with presumed benefits of the geographic location of sanatoriums. Ironically, it has now been established that it is not the geography or climate of such institutions that is beneficial, but other aspects of their treatment programs, principally close supervision by those familiar with the disease and a certain degree of rest and regularity of routine. It is now apparent that the results obtained in sanatoriums could have been achieved quite as well in general hospitals or in specialized tuberculosis hospitals located in cities and associated with general hospitals.

Recently, following profound changes in the treatment of tuberculosis, there has begun a trend toward care of tuberculosis patients in

general hospitals. The majority of sanatoriums, built during the great wave of providing tuberculosis beds in the early decades of this century, remain geographically isolated to a considerable extent. Modern communications have narrowed the gap in distance and time between sanatoriums and medical centers, but relatively few tuberculosis hospitals are integrated parts of centers providing complete medical care.

It is difficult to estimate how many patients now are receiving care for tuberculosis in general hospitals. The directory of tuberculosis hospitals and sanatoriums formerly published by the National Tuberculosis Association every 3 or 4 years, which could be a source for such information, has not appeared with figures later than those for 1953. There are no plans for publishing another directory in the immediate future because the picture is changing so rapidly that any tabulation would be out of date before it came from the presses.

Nevertheless, let us consider such figures as are available for the United States. By 1953 or 1954, the period of peak demand for tuberculosis hospitalization, there were 108,000 tuberculosis beds in the United States. (In all these figures I am excluding beds for tuberculosis in mental hospitals or penal institutions.)

Dr. Tucker is director of the Tuberculosis Service, Veterans Administration. He presented this paper, with minor modifications, at the 9th Annual Conference of the Tuberculosis Institute of Chicago and Cook County, in Chicago, on March 20th, 1958.

for in these the individuals would remain as charges regardless of their tuberculosis.) At the turn of the century, when there were 200 deaths per 100,000 population, there were less than 10,000 tuberculosis beds, or 1 bed for each 18 annual deaths. By World War I the number of beds had reached 50,000, a ratio of 1 bed for each 3 annual deaths. Many of us remember the drive of the 1930's and 1940's to have enough beds for a ratio first of 2 beds per annual death, then 2.5, and finally 3, in all States. As progress was made in avoiding tuberculosis deaths, the number of deaths declined from 165,000 early in the century to 100,000 in the middle 1920's, to 50,000 in the middle 1940's, and to 20,000 in the middle 1950's (in spite of great population growth), and the ratio of beds to deaths finally reached 5:1 for the Nation and more than 10:1 in many States.

During all of this period the majority of beds for tuberculosis were in sanatoriums. In 1953, 92 percent of the 108,000 beds were so located.

Furthermore, the majority of the 9,000 tuberculosis beds in general hospitals were there for certain specific limited purposes, not for routine long-term care. The Index of Hospitals and Sanatoria With Tuberculosis Beds, published by the Public Health Service annually in recent years, is sprinkled liberally with the following kind of footnotes for general hospitals listed as providing care of tuberculous patients: diagnosis only, surgery only, diagnosis or short-term care only, temporary hospitalization only pending transfer, less than 5 tuberculosis beds, all patients are transfers in for rehabilitation, takes only ambulatory patients, and no specific number of beds set aside for tuberculosis.

Because data for the United States as a whole are difficult to obtain in recent years, I shall turn to the experience of the Veterans Administration. Since World War II the VA has cared for approximately one-tenth to one-eighth of all the tuberculosis patients of the country, roughly the same proportion as the ratio of veterans to total population. In 1954, the year of peak demand, there were 14,200 beds for treatment of tuberculosis in hospitals, excluding 2,300 for the care of the psychiatric tuberculous. Of these 14,200 beds, 8,200, or

58 percent, were in tuberculosis hospitals, the remainder being in general medical and surgical hospitals.

Prior to World War II a far higher percentage were in tuberculosis hospitals. The fortuitous coincidence of the opening of a number of new VA general hospitals with a greatly increased demand for tuberculosis care among veterans immediately after the war permitted the establishment of many units or sections for tuberculosis patients in general hospitals. Furthermore, the lessening of the demand for beds since 1954 has made it possible to effect adjustments generally favoring locations where more complete medical care is available. By 1957, the VA had approximately 11,600 beds for tuberculosis patients (other than in mental hospitals). Of these, 5,200, or 45 percent, were in general hospitals. The trend is continuing in the VA, and it probably will not be many years before more than half of the veterans requiring treatment for tuberculosis in VA hospitals will receive it in general hospitals.

These gross figures, moreover, do not tell the whole story. Just as an increasing proportion of the care of the tuberculous is being provided in what are officially designated as general hospitals, so have officially designated tuberculosis hospitals in the VA increasingly become in fact general hospitals. There is an almost continuous spectrum among the 173 VA hospitals, with respect to beds for tuberculosis, from 100 percent for nontuberculous conditions to 100 percent for tuberculosis. In fact, if the 4 VA "tuberculosis hospitals" in which more than 50 percent of the patients have nontuberculous diseases are added to the VA's general hospitals, these hospitals in 1957 cared for more than half the VA's total tuberculosis patients (6,000 out of 11,600 beds).

Reflection of Treatment Changes

What does this changing picture with regard to where patients with tuberculosis are cared for reflect?

It reflects the most rapid changes in the treatment of tuberculosis since it was established 75 years ago that tuberculosis is generally a curable disease. Treatment methods have changed drastically since the discovery of

specific drugs. Streptomycin has been generally available for 11 years; isoniazid for less than 6. Yet it was not until about 4 years ago that the clear superiority of prolonged drug treatment, replacing many other forms of therapy, was established.

Nearly everyone is aware of the declining demand for tuberculosis beds in the United States and of the closing of many sanatoriums, including Trudeau Sanatorium, the bellwether of them all, a few years ago. What is not so generally realized is that the number of individuals requiring treatment has diminished very little, or not at all, in recent years. In the Veterans Administration, for example, there was no decrease in the last 3 years in the number of veterans admitted to VA hospitals for treatment of active tuberculosis: there was in fact a 2 percent increase. During the same period there was a 16 percent decrease in the average number of patients hospitalized for tuberculosis. These apparently conflicting figures can be explained only in one way: the same number of patients are being treated for a shorter period of time in the hospital on the average. In the VA the average has decreased from slightly less than a year to a little more than 8 months. At the same time, as has been true generally throughout the country, the percentage of deaths has decreased drastically, and the percentage reaching "inactive" stage has increased, so it is clear that the shortening of hospitalization has not resulted in less effective control of the disease.

I shall try briefly to characterize the changes that have occurred in less than a decade.

Bed rest used to be the *sine qua non*, the essential; today complete bed rest is employed only for the seriously ill patient, and much more freedom of physical activity within the hospital is permitted, and even regarded as beneficial.

Collapse therapy, such as pneumothorax, thoracoplasty, and pneumoperitoneum, was once widely employed; today these procedures are relied upon less and less, with resectional surgery playing a more prominent role.

Formerly the return from a period of severely restricted activity to a more or less normal life was prolonged and gradual, usually extending, in the hospital and out, over a period

of several years; furthermore, many individuals were advised permanently to change their occupation. In contrast, today the transition from hospital to full-time activity can be much more rapid, and it is seldom that a change in occupation, even for manual laborers, is indicated.

The principal element permitting these changes has been the effective use of drugs. (The preceding applies primarily to the care of patients with pulmonary tuberculosis. Patients with certain other forms of tuberculosis, as of the kidneys or the bones, also fit this pattern, but need supporting consultant services to a greater extent.)

When we speak of general hospitals, we usually think of private hospitals where the majority of care is for relatively acute medical or surgical conditions, requiring relatively brief periods of hospital care. What may not be generally realized is that in such hospitals rather drastic changes are occurring also. As our population gradually grows older, on the average, it is more susceptible to the diseases described as chronic, which require longer periods of medical care. The need for long-term care has become so acute in many communities that an entirely new movement, the home medical care plan, has arisen to relieve the increased hospitalization demands, principally for the more chronic medical conditions.

Thus it is, in recent years, as a broad generalization, that "acute" hospitals have come to be more "chronic" in the care they provide, while such a "chronic" disease as tuberculosis has come to be more "acute" in its hospitalization requirements. It is principally because of this gradual merging in the function of these two types of hospitals, formerly so divergent, that it is possible for general hospitals to consider caring for tuberculosis patients.

Two other major trends in the field of tuberculosis need to be mentioned. One is the increasing complexity of the medical care of tuberculosis. More tuberculosis patients are in older age groups, susceptible to other diseases of the elderly, so that more access to specialized consultation services is required than formerly. There is much more need for extensive laboratory work, not only that of tuberculosis bacteriology, but also that associated with drug treat-

ment and with the management of related nontuberculous conditions. And, as has been mentioned, there is need for access to the now highly specialized branch of surgery, thoracic surgery, chiefly of the resective, or excisional, type. In brief, the best care of the tuberculosis patient today can be given only where many diverse supporting medical and allied disciplines can be brought to bear. These usually are available in general hospitals. They also have been brought successfully to many tuberculosis sanatoriums through the extensive use of consultants. But clearly the greater the geographic separation the more difficult this integration.

The other trend has to do with the number of physicians interested in the tuberculosis field. It is sad and ironic but true that for many decades a majority of the physicians caring for tuberculosis patients were those who themselves acquired the disease, recovered from it, and were advised to practice the more sheltered brand of medicine to be found within a sanatorium. The control of the spread of tuberculosis has been so great, fortunately, that now far fewer physicians are placed in this position. While accurate figures are not available, it is my impression that the supply of physicians to care for tuberculosis has decreased in recent years at a greater rate than the decrease in the number of patients hospitalized.

The training of physicians has much to do with this decrease. Today it is rare that the internist completing his residency training elects to enter the field of tuberculosis per se. He often is interested in the field of pulmonary diseases, which includes tuberculosis, but he is usually unwilling to limit his practice exclusively, or even to devote a really large part of it, to the care of tuberculosis.

These and other facets of the changing picture of tuberculosis make it almost inevitable that in the future an increasing proportion of the care of tuberculosis patients will be in "general" hospital settings.

Answers to Objections

It has been my experience, in discussing the feasibility of caring for tuberculosis patients in general hospitals, for many individuals to

think at first of the difficulties to be overcome. It has also been my experience, in three separate general hospitals, that it can be satisfactorily demonstrated, to hospital administrators, to boards, and to others, that the advantages are real and that potential disadvantages are not in fact as great as they may seem.

One of the first problems to be mentioned, and perhaps the principal one, is contagion. Certainly tuberculosis continues to be a communicable disease. However, of a group of 100 tuberculosis patients, today, with effective drug treatment, only 25 to 40 (depending on how serious is the disease among the patients admitted) are infectious at any time, instead of the vast majority, as formerly. Today the average tuberculosis patients become "negative" in 4 or 5 months or less after the start of treatment. Thus "isolation precautions" are not necessary for the majority of tuberculosis patients. Patients may be separated into "positive" and "negative" groups by rooms or by wards, with isolation precautions restricted to the former and much more freedom permitted the latter.

There is also the associated risk of hospital employees' acquiring active tuberculosis. In the Veterans Administration, some 100,000 hospital employees receive regular X-ray examinations each year. The new tuberculosis case rate among them has been declining progressively in all VA hospitals, but the important thing to report is that the risk is not greater, in the VA, in tuberculosis hospitals than in general hospitals. Furthermore, among about 60 general hospitals in the VA caring for tuberculosis patients, in which the percentage of patients hospitalized for tuberculosis ranges from less than 5 percent to more than 40 percent, there is no statistically significant relationship between percentage of tuberculosis patients and rate of development of active tuberculosis. There is some risk in working in any hospital, although the risk is declining, especially as the practice of X-raying hospital patients on admission, to detect the unknown infectious case, spreads. The essential points are that the risk of hospital employees' acquiring tuberculosis is not greater in general hospitals caring for tuberculosis patients than in general hospitals not caring for them and that

it is not less in general hospitals than in tuberculosis hospitals.

A separate study made in the Veterans Administration reveals that volunteers working in VA hospitals, whether with or without tuberculosis patients, run essentially no risk of getting active tuberculosis. Among 20,000 examined last year, not a single new case was found.

A number of other problems in hospital management associated with the contagiousness of the disease deserve brief mention. It was once thought that many hospital facilities could not be used in common by tuberculous and non-tuberculous patients. It is now known that much less duplication is necessary than was formerly thought. Studies of library books used by infectious tuberculosis patients have not shown that they are carriers of tuberculosis germs. Separate dishwashing facilities are not necessary if proper precautions are taken in preparing dishes for washing and the washers are properly operated. Separate dental and ear, nose, and throat units do not need to be established if tuberculous and nontuberculous patients are treated at separate times and if instruments are carefully disinfected. Patients with infectious tuberculosis may safely be transported to the hospital laboratory facilities or to the X-ray department by carrying out simple and effective isolation precautions. Letters written by tuberculous patients may safely be dispatched. With moderate safeguards infectious tuberculosis patients may enjoy the privileges of hospital stores or canteen services.

These statements do not, of course, suggest that all isolation precautions may be abandoned. Quite the contrary; they are made on the assumption that such precautions are carried out meticulously when indicated, for the "positive" patient. Wearing of gowns and masks, handwashing, restriction of infectious patients to certain geographic areas, special techniques for disposal of infectious waste materials, special handling of contaminated laundry, and other special techniques continue to be needed. But it has been established that these measures do not introduce insuperable obstacles. And when these relatively minor inconveniences are balanced against the greater

advantage to the tuberculosis patient of having direct and immediate access to all the facilities of the general hospital, increasingly there is recognition that the general hospital can, and probably should, share in the care of tuberculosis patients.

One more aspect of hospital care for the tuberculosis patient should be considered, that is, rehabilitation. First, as has already been implied, extensive rehabilitation is required not nearly to as great an extent as formerly; second, retraining of tuberculosis patients for new professions or occupations is now seldom indicated; and, third, "on-the-job" training, if indicated, can now occur after a relatively short period in the hospital, while the patient is still under close medical supervision on an outpatient basis and while he is continuing to take drugs.

However, certain elements of what is commonly called rehabilitation are still desirable for tuberculous patients. While necessarily hospitalized, they need (a) diversion, (b) an opportunity to study if they so desire, and (c) entertainment. Fortunately most of these needs can be supplied through the voluntary services available to most general hospitals, and rehabilitation counselors in many States are glad to work with the staffs of local hospitals. In brief, the so-called rehabilitation needs of tuberculosis patients have now become less exacting and generally can be encompassed within the framework of the general hospital.

Conclusion

I have tried to describe broadly the changing pattern of hospital treatment for tuberculosis in the past decade; to indicate some of the reasons why general hospital treatment for tuberculosis is not only feasible but may be conducive to improved medical care; and to indicate some of the problems. Nothing I have said is to be construed as indicating that excellent care cannot be given in a tuberculosis hospital or sanatorium specializing exclusively in the care of the tuberculous. It can be, but it is more difficult. What I have tried to, outline is the feasibility of the general hospital's participating in the treatment of tuberculosis patients.

I shall close by gazing a little into the future. The time will come, I feel sure, when the average, well-trained physician is as well trained in tuberculosis as he now is in cardiac or digestive disorders. The time will come, I am confident, when individuals with active tuberculosis—constantly diminishing in number—can be cared for by such a well-trained physician in a general hospital, small or large, in their home communities.

The time of course may come when we shall

not have to worry about treating tuberculosis at all! But I cannot envision that event in the predictable future. Tuberculosis remains the No. 1 infectious disease in this country. I do believe that the general hospital will play an increasingly prominent role in its control, but only if the current sound medical and public health principles continue in force. Care in the general hospital will, for a time, supplement other tuberculosis control measures; ultimately it may become the mainstay of our efforts.

Seminars in Dental Public Health

Seminar courses in public health dentistry for dentists employed full or part time in local public programs have been the major activity of the dental public health unit established at Harvard University in December 1956. An initial course, lasting from January through May 1957, consisted of 10 two-hour sessions. For the 1957-58 academic year, the course was expanded to 18 two-hour sessions over a 9-month period.

The Harvard dental public health unit is an outgrowth of efforts by the division of dental health of the Massachusetts Department of Public Health to provide assistance in public health dentistry for the more than 200 independent local dental health programs in the State. Located at the Harvard School of Dental Medicine, the unit is directed and staffed by Harvard faculty members. It receives financial support and consultative service from the State health department.

Following an introductory session on public health, the course covers such subjects as biostatistics, epidemiology, fluoridation, nutrition, health programs in relation to cultural patterns, health education, organization of medical and dental care, and dental program planning. All sessions are held in the evening from 7 to 9 o'clock. In addition to the specified number of lecture-discussion sessions, each course has included a visit to a water filtration plant.

Trainees in the first course numbered 11.

Nine were selected from among a group of local public health dentists and dental health directors, and 2 came from the Council on Dental Health of the Massachusetts Dental Society. All the participants were awarded certificates of satisfactory completion.

Besides conducting seminars, the Harvard unit offers consultation on technical subjects related to dentistry for public health dentists in local programs and serves as a diagnostic and treatment resource for referred cases presenting medico-dental problems beyond the scope of local resources.

The unit is directed by Dr. James M. Dunning, lecturer on public health dentistry at the Harvard School of Dental Medicine. Faculty members of both the University's School of Dental Medicine and its School of Public Health have taken part in the seminars.

Following this lead set by Massachusetts, the Hartford (Conn.) Health Department is currently planning, under the direction of Dr. Leonard F. Menczer, a similar seminar program to begin in January 1959. Letters have been written to the directors of each of the schools, hospitals, and clinics where dentists are employed to apprise them of the proposed undertaking and to enlist their cooperation. The Greater Hartford Area has some 11 agencies using the services of dentists, and the number of dentists in these agencies may be as high as 50.

publications

Housing Codes—The Key to Housing Conservation. Volume 1. Code enforcement problems and recommendations. Volume 2. Minimum housing standards ordinance. Volume 3. Administrative guide for local programs. 72, 79, and 34 pages, respectively.

A study of housing codes and their administration in a representative sample of communities in New York State and elsewhere, sponsored and financed jointly by the New York State Division of Housing and the Urban Renewal Administration of the Housing and Home Finance Agency, has resulted in this three-volume report.

Following a summary of the study findings in volume 1, volume 2 sets forth a recommended ordinance establishing minimum requirements for existing housing. The ordinance is intended for enactment by the local legislative body. In volume 3 are recommendations concerning methods of adoption, enforcement, and inspection.

A limited number of copies are available from the Bureau of Community Development, State Division of Housing, 270 Broadway, New York 7, N. Y.

Primer for Paraplegics and Quadriplegics. *Patient Publication No. 1; 1957; 38 pages; 50 cents.*

The nature of paraplegia and the consequent adaptations of normal living that become necessary are described in simple terms. Clothing, diet, and excretory functions of the paraplegic are fully discussed.

A chapter prepared by the Office of Vocational Rehabilitation, Department of Health, Education, and Welfare, describes services offered paraplegics through State rehabilitation agencies, giving the broad conditions of eligibility, a general outline of methods, and a discussion of employment prospects.

This manual, the first of a series regarding specific disabilities, is directed to all persons disabled by

damage to the spinal cord and to their families. Copies may be obtained from the Institute of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center, 400 E. 34th Street, New York 16, N. Y.

✓ **Animal Disease and Human Health.** *Annals of the New York Academy of Sciences; vol. 70, art. 3; June 3, 1958; pages 277-761; \$5.00.*

A publication on comparative medicine that should prove useful to the professions of the medical sciences, this series of 40 papers discusses diagnosis, control, and treatment of diseases which can be transmitted from lower animals to man.

The monograph is the result of a conference held by the New York Academy of Sciences in collaboration with the Communicable Disease Center, Public Health Service, Atlanta, Ga., September 11-13, 1957. All papers were prepared by persons well versed in their respective specialties, and the publication was edited by James Lieberman, conference chairman.

Copies may be purchased through the Executive Director, New York Academy of Sciences, 2-East Sixty-third Street, New York 21, N. Y.

Health Statistics From the U. S. National Health Survey—The statistical design of the health household-interview survey. *PHS Publication No. 584-A2; 1958; 41 pages; 35 cents.*

The initial statistical design of the continuing health household-interview survey, which is a major phase of the program of the U. S. National Health Survey, is described. The book contains chapters on background and objectives, summary of structure of the household-interview survey, survey procedures, and sample design.

There are eight appendixes: illustration of content of initial basic household questionnaire, estimating equations, sampling and measure-

ment errors, stratification of primary sampling units, the sampling allocation problem, illustration of drawing PSU's and households into the sample, randomizing assignments, areas, and weeks, and selected statistics about the survey.

Nursing Resources—A progress report of the program of the Division of Nursing Resources. *PHS Publication No. 551; 1958; 43 pages; 30 cents.*

A chart book with text, this brochure describes the changes that have occurred in the practice of nursing during the last few decades and how the Division of Nursing Resources is helping to solve some of the problems created by these changes.

The 20 charts illustrate various aspects of nursing, including the Nation's supply of professional and nonprofessional nursing personnel, their distribution in the population, and their training and utilization.

✓ **School Health Services—A selective review of evaluative studies.** *Children's Bureau Publication No. 362; 1957; by Bronson Price; 149 pages; 45 cents.*

Significant studies of school health services made during the last 30 years are reviewed in this book. The purpose is to help research workers and professional workers in school health services evaluate current programs and determine future needs.

The studies fall into five major groups, according to the methods employed: use of statistical rates as study criteria, health survey findings, use of expert judgment, developing study samples and reexamining the children, and experimental research approaches. Practically all the studies relate to health services in the elementary schools, where by far the greatest effort in school health services is concentrated.

Rehabilitation of Deaf-Blind Persons—A manual for professional workers. Vol. 1; 1958; 246 pages; \$3.70

Technical aspects of rehabilitation of the deaf-blind are covered in this

series of papers dealing with problems of communication, social services, general health and sight-hearing, vocational adjustment, and recreation services for the deaf-blind. The principal methods of communication with the deaf-blind, including the recently developed International Standard Manual Alphabet recommended for worldwide adoption, are described and evaluated.

Prepared as an outcome of a 2-year study by the Industrial Home for the Blind and the Office of Vocational Rehabilitation, the manual will be followed by more detailed and technical papers on the same general subjects.

Copies may be obtained from the Industrial Home for the Blind, 57 Willoughby Street, Brooklyn, N. Y.

Bibliography of Medical Reviews. *National Library of Medicine; Vol. 3; 1958; 205 pages; \$1.00.*

References to approximately 2,885 review articles, 583 of which are not duplicated in the *Current List of Medical Literature*, are contained in this third volume of the bibliography.

The subject section follows the general pattern of the previous volumes, and the number of references cited in the review article is given in parentheses at the end of the reference. In addition a detailed cross-reference structure and a complete author index are provided.

Health Statistics From the U. S. National Health Survey—Preliminary report on disability, United States, July–September 1957. *PHS Publication No. 584-B4; 1958; 30 pages; 30 cents.*

Estimates of person-days of restricted activity, including days people were confined to bed, stayed home from work, or only cut down on their usual daily activities, are presented in 7 general tables supported by 3 graphs and 18 detailed tables. Explanatory text includes appendixes containing technical notes on methods and definitions of terms.

The number of persons with chronic limitations of activity or mobility is estimated by the degree

of limitation. The data are derived from continuing household interviewing carried on for the Public Health Service by the Bureau of the Census.

Research Publications of the National Heart Institute—January 1953–June 1958. *PHS Publication (unnumbered); 1958; 110 pages; 40 cents.*

A listing of scientific papers and abstracts by staff members of the National Heart Institute, this bibliography documents the more recent work in the conduct of their intramural research.

The publications are listed chronologically by year, and alphabetically by senior author, under the name of the research unit in which the studies were performed. The listing thus provides, for scientists and others interested, a record of progress made through investigations carried on at the institute.

State Occupational Health Programs. *PHS Publication No. 605; 1958; 41 pages; 30 cents.*

Abstracts of State program plans for occupational health are grouped by States and regions. This booklet also summarizes major health needs and administrative problems pertinent to occupational health, as expressed by State program directors. Selected administrative information for each State, including placement of responsibility for occupational health in the health department and staff assigned to the program, is shown in tabular form.

Plans prepared by the majority of the States cover a 2-year period beginning with fiscal year 1957. In some States air pollution control activities were included, but these are not described in the abstracts.

The Training Program of the National Institute of Mental Health, 1947–1957. *PHS Publication No. 603; 1958; 65 pages.*

A comprehensive review of the training program at the National Institute of Mental Health during the first decade of operation, this report covers its basic philosophy, a survey of accomplishments during

the past 10 years, a detailed description of the training program in 1957 and 1958, and an appraisal of mental health training needs during the next 5 years.

The report also contains a historical account of the development of the program and an analysis of the research fellowship and career investigator programs. In addition, 11 appendixes provide comprehensive analyses of the expenditures for the various training programs with complete information about the relative proportions expended for teaching personnel, trainees, and other items.

Indians on Federal Reservations in the United States—A digest, Portland Area. *PHS Publication No. 615, part 1; 1958; 50 pages.*

Brief summaries of selected information about each Federal Indian Reservation in three States of the Portland Indian Health Area—Idaho, Oregon, and Washington—comprise this digest.

The population groups, their social characteristics, including homes, education, and income sources, and their health status and services are discussed. Included also is a description of the location, ownership, and topography of the reservation land.

Successive parts of this digest will be published, each pertaining to a jurisdictional area of the Division of Indian Health, Public Health Service.

Public Health Nursing Service to Families—A collection of case studies. *PHS Publication (unnumbered); 1958; 145 pages.*

Case studies from official health agencies have been compiled to illustrate the variety of cultural, racial, and economic groups served by public health nurses and the diversity of services provided. Each of the 19 presentations includes a brief description of the family unit, a summary of its medical problems, and a transcript of the nursing notations.

Although this monograph was prepared primarily as an aid for teaching public health nursing concepts and practices to student and graduate nurses, it should be useful also to

publications

public health nursing supervisors and administrators in evaluating the comprehensiveness of nursing care, analyzing the usefulness of the nursing record, and demonstrating program accomplishments.

Guide to Russian Medical Literature. PHS Publication No. 602; 1958; edited by Scott Adams and Frank B. Rogers; 89 pages; 40 cents.

Prepared to assist investigators unfamiliar with the indexing, abstracting, and bibliographic services, this book contains chapters on western sources of information about Russian medical literature, on the Russian systems for indexing and abstracting, on translation activities and services, and on the collections of Russian medical literature in the National Library of Medicine. Three translations of Russian papers on medical libraries and the medical printing industry of the U.S.S.R. are also included.

The guide was prepared cooperatively by the National Library of Medicine and the National Institutes of Health.

The Nation's Health Facilities—Ten years of the Hill-Burton hospital and medical facilities program, 1946–1956. PHS Publication No. 516; 1958; by Leslie Morgan Abbe and Anna Mae Baney; 181 pages; \$1.25.

Progress in planning and constructing health facilities with Federal assistance through the Hill-Burton program is reviewed. The status of each type of health facility reported by the State plans is given as of July 1956. These plans include nearly all types of health facilities in the Nation except Federal facilities and doctors' and dentists' private offices.

Much new analytical material, particularly for general hospitals in metropolitan areas, general hospital service regions, and psychiatric

units in general hospitals, is included. For convenient reference, the book also has limited data for January 1, 1958, in a supplement to the appendix. Eleven charts and 45 tables appear throughout the book.

Sewage and Water Works Construction, 1957. PHS Publication No. 608; 1958; by William H. Abbott, Kenneth H. Jenkins, and Elsie Gibson; 15 pages; 20 cents.

Construction contract awards during calendar year 1957 for sewage treatment plants, collecting sewers, and water systems are contained in this report. The tables present data arranged by States, population groups based on community size, and contract size groups.

Directory of State and Territorial Health Authorities, 1958. PHS Publication No. 75; 1958 revision; 99 pages; 35 cents.

Revised as of May 1958, this directory lists by State the name of each health department, the officer in charge, the principal organizational units within the department, and the names of officials directing those units. Included also are officials of other State agencies directing grant-in-aid programs of the Public Health Service and of the Children's Bureau grant program for crippled children's services.

Personnel of the Public Health Service in charge of functions closely associated with State health departments are listed in the appendix.

Farmers' Expenditures for Health Care in 1955. Agriculture Information Bulletin No. 191; by Alvin L. Bertrand and Donald G. Hay; 1958; 33 pages; 25 cents.

Data collected in the survey of farmers' expenditures in 1955, conducted by the Department of Agriculture and the Bureau of the Census, indicate the items of health

care which farm families buy and their expenditures for each.

Average family expenditures and aggregate outlays are tabulated by region and geographic division, and variations are analyzed. The report also examines the relation of health care expenditures to selected socioeconomic factors: economic class of the farm, age of the operator, total living expenses, and family size.

Bibliography of Space Medicine. PHS Publication No. 617 (Public Health Bibliography Series No. 21); 1958; 49 pages.

Almost 400 references have been selected for this bibliography from the indexes and catalogs of the National Library of Medicine and from leading aviation, aviation medicine, and astronautical publications. They are arranged in broad subject classes, in inverse chronological order, and alphabetically by author.

The subjects include sealed cable problems, acceleration and deceleration, fractional and zero gravity, cosmic radiation, survival problems, psychological and social problems, ground crew problems, and extra-terrestrial aspects.

Highlights of Heart Progress, 1957. PHS Publication No. 595; 47 pages; 25 cents.

Detailed, yet understandable to the layman as well as the professional, this booklet describes program developments and research studies conducted and supported by the National Heart Institute during 1957.

Research findings on 20 subjects in such major heart disease categories as atherosclerosis and coronary heart disease, high blood pressure, and heart failure are reported. Surgery and new knowledge and methods are discussed in the remaining 27 items.

Vital Statistics of the United States, 1956—Mortality data. NOVS Publication, vol. II; 525 pages; \$1.25.

Twenty tables of final detailed mortality data for 1956 are presented in this volume. The material

is tabulated according to places of occurrence and residence, month of occurrence, color, race, sex, age, and cause for persons in the United States, each State, metropolitan and nonmetropolitan counties, each county, and certain cities.

Volume II of this annual publication is published prior to volume I.

I. Health Insurance Coverage by Age and Sex, September 1956. *Research and Statistics Note No. 13; May 21, 1958; 6 pages.*

II. Characteristics of the Population with Hospitalization Insurance, September 1956. *Research and Statistics Note No. 14; May 27, 1958; 7 pages.*

III. Health Insurance in the Population 65 and Over. *Research and Statistics Note No. 17; June 11, 1958; 9 pages.*

IV. Hospital Utilization by Persons Insured and Uninsured in September 1956. *Research and Statistics Note No. 19; June 23, 1958; 9 pages.*

V. The Relationship of Marital Status to Hospital Utilization and of Insurance Ownership to Methods of Paying for Hospital Care, Year Ending September 1956. *Research and Statistics Note No. 25; July 23, 1958; 9 pages.*

A series on the extent of health insurance protection in the United States prepared by the Social Security Administration, these five notes are based on replies to questions added to the Current Population Survey.

The data have been analyzed by age, sex, race, and marital and labor status. Differences between the uninsured, the insured, and the entire population in these demographic characteristics are examined. Income data are included in the note dealing with the aged.

Copies of the notes may be obtained from the Division of Program Research, Social Security Ad-

ministration, Department of Health, Education; and Welfare, Washington 25, D. C.

VD Fact Sheet, 1957. *PHS Publication No. 341; 1958; 14th revision; 22 pages.*

Basic statistics on venereal disease incidence, prevalence, and treatment are provided for persons interested in public health and venereal disease problems.

Other statistics relate to the estimated annual cost of uncontrolled syphilis, mortality and insanity caused by syphilis, health department casefinding activities, morbidity by age, effect of syphilis on pregnancy, and incidence of reactions to penicillin in a venereal disease clinic population.

This information supersedes any previously published data.

Refuse Collection and Disposal—An annotated bibliography, 1956–1957.

PHS Publication No. 91 (Public Health Bibliography Series No. 4, Supplement C); by Edward R. Williams; 43 pages; 35 cents.

The references comprising this supplement have been annotated to facilitate the exchange of information in both the research and operational phases of refuse sanitation. They are arranged in sections which correspond to the various administrative and operational phases of the entire field of refuse collection and disposal.

Communicable Disease Center—Report of activities. *PHS Publication No. 599; 1958; 69 pages.*

A synthesis of the major activities of the Communicable Disease Center for the fiscal year 1956, this report describes the scope, nature, and interrelationships of the Center's cooperation with States and Territories to provide assistance in epidemics and natural disasters; consultations, demonstrations, and

program reviews; and laboratory services.

The book is arranged along the broad categories of the Center's pattern of operation. The major portion is devoted to field and laboratory investigations of diseases. Training activities are outlined under four specific headings.

Proceedings, 1957 Annual Conferences—Surgeon General, Public Health Service, and Chief, Children's Bureau, with State and Territorial health officials. *PHS Publication No. 580. 1958. 90 pages.*

The proceedings cover addresses and actions at the three 1957 conferences of the Surgeon General and the Chief of the Children's Bureau with the State and Territorial health officers, mental health authorities, and hospital and medical facilities survey and construction authorities.

Recommendations and resolutions of the participating State and Territorial officials pertain to such subjects as mental health, medical facilities, home accident prevention, patient care in nursing homes, rehabilitation, air pollution, and implications of the social security programs.

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared by other Federal agencies.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications other than its own.

THE EXPERIMENTAL TRANSMISSION OF POLIOMYELITIS TO THE EASTERN COTTON RAT, *SIGMODON HISPIDUS*

By CHARLES ARMSTRONG, *Senior Surgeon, Division of Infectious Diseases, National Institute of Health, United States Public Health Service*

Through the courtesy of Dr. Max Peet, of the Department of Surgery, University of Michigan, we received on August 28, 1937, a sample of brain and cord from an 18-year old boy, one of several bulbar cases of poliomyelitis which occurred at Lansing, Mich., during that summer. A strain of virus was recovered from the material which has now been through 15 monkey passages and which clinically, and pathologically as reported by Surgeon R. D. Lillie, is apparently a strain of poliomyelitis. Neutralization tests with this virus have not been done.

On November 8, 1937, several species of rodents, including a cotton rat received through the courtesy of Dr. A. Packchianian, of the National Institute of Health, were inoculated with a fourth monkey passage of the virus. The cotton rat remained apparently well until the twenty-fifth day, when it appeared nervous and tremulous. On the following day it was paralyzed in both hind legs and was sacrificed.

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SEPTEMBER 22, 1939, pp. 1719-1721

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Investigations of Staphylococcal Infection Acquired in Great Britain's Hospitals

R. E. O. WILLIAMS, M.D.

In his brief account of the work on staphylococcal infection in British hospitals during the past 10 years, Dr. Williams offers the following observations:

"Practically all the staphylococci responsible for epidemics are resistant to penicillin and most are resistant to other antibiotics as well. It is possible that by now selection by antibiotic treatment has increased the proportion of virulent strains as well as of antibiotic resistant strains, but I do not think there is good evidence that the resistant strains of today are fundamentally more virulent than the sensitive strains of yesterday. If the use (or misuse) of antibiotics has increased the incidence of staphylococcal cross-infection, this is more likely to be due to our reliance on drugs instead of asepsis for preventing infection rather than to any malign effect of the antibiotics in selecting especially virulent staphylococci. If there were no cross-infection, the development of drug resistance would have a relatively limited importance."

IT IS convenient to start a review of British investigations on the hospital spread of staphylococcal infection by recalling the work of Devenish and Miles (1). They studied a

Dr. Williams, director of the Streptococcus, Staphylococcus, and Air Hygiene Laboratory, Public Health Laboratory Service, London, England, delivered this paper at the National Conference on Hospital-Acquired Staphylococcal Diseases held in Atlanta, Ga., on September 15, 1958. He wishes to acknowledge the benefit derived from numerous discussions with colleagues, especially Drs. R. Blowers, R. A. Shooter, O. M. Lidwell, and M. Patricia Jevons.

series of postoperative infections in a surgical unit and were able to trace them quite clearly to the introduction of staphylococci, at the time of operation, by one surgeon who was a healthy nasal and skin carrier. This study was important not only because it showed the potential danger of a healthy carrier of staphylococci but also because it was the stimulus for a great deal of basic work on the frequency with which the cocci were carried by normal adults (2, 3).

There was in Britain a great deal of interest in hospital infection during the war years. At that time the hemolytic streptococcus was regarded as the important cross-infecting organism, and there were at first only sidelong glances at the staphylococcus. The streptococcus offered a simpler problem than the staphylococcus has proved to be, even without considering antibiotics, because its rarity in fresh wounds and relative rarity in the respiratory tract made it immediately clear that cross-infection, not self-infection, must be involved. The work during the war was important in showing that streptococcal cross-infection of surgical wounds could be controlled by closing channels of contact infection, by no-touch dressing techniques, and by the maintenance of an aseptic routine in the wards as rigorous in its way as those already regarded as standard in the operating theater (4).

For the protection of most wounds from streptococci, attention to contact infection seemed to suffice. But with burns this was not enough, and Colebrook (5), in pioneer work at Birmingham in 1950, supplemented the no-touch dressing technique with chemoprophyl-

1719

September 22, 1939

THE EXPERIMENTAL TRANSMISSION OF POLIOMYELITIS TO THE EASTERN COTTON RAT, *SIGMODON HISPIDUS HISPIDUS*

By CHARLES ARMSTRONG, *Senior Surgeon, Division of Infectious Diseases, National Institute of Health, United States Public Health Service*

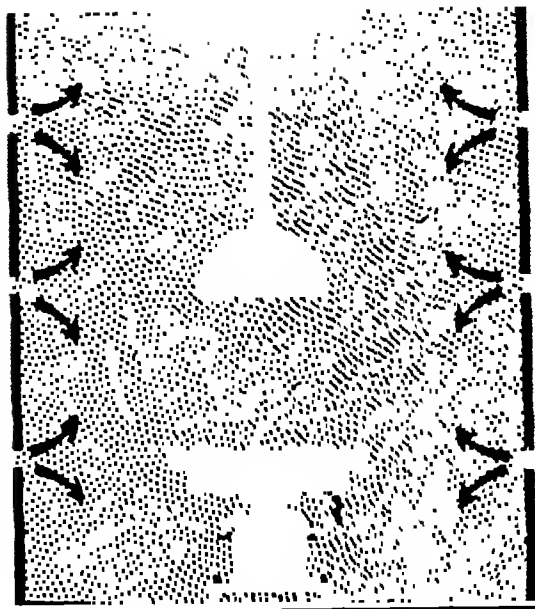
Through the courtesy of Dr. Max Peet, of the Department of Surgery, University of Michigan, we received on August 28, 1937, a sample of brain and cord from an 18-year old boy, one of several bulbar cases of poliomyelitis which occurred at Lansing, Mich., during that summer. A strain of virus was recovered from the material which has now been through 15 monkey passages and which clinically, and pathologically as reported by Surgeon R. D. Lillie, is apparently a strain of poliomyelitis. Neutralization tests with this virus have not been done.

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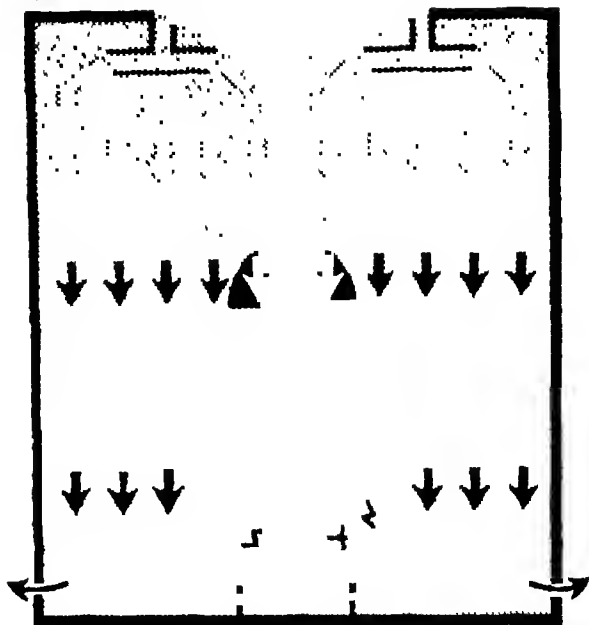
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CONVENTIONAL (turbulence)



PISTON

These figures are high enough, but to them must be added the quota from epidemics in which the attack rates may be much higher. The only measure we have of the frequency of such epidemics is the number of incidents from which staphylococci are sent for type identification. In 1957, the Staphylococcus Reference Laboratory at Colindale, London, received specimens from 30 outbreaks with 10 or more patients affected. The laboratory serves an area with a population of $13\frac{1}{2}$ million, and it is sent material only from a proportion, perhaps a small proportion, of the epidemics that occur.

Nor do wound infections and infant sepsis exhaust the list of staphylococcal infections that are acquired in hospitals. Pneumonia is certainly not uncommon: we observed 5 cases of pneumonia in the course of a surgical ward epidemic having 17 cases of wound infection and an attack rate of about 2 percent in the same ward in a subsequent 8-month period free from epidemics (10, 11). Urinary infections and skin lesions among adult patients are also seen.

Postoperative staphylococcal diarrhea has been observed in a number of hospitals, both in sporadic cases and in epidemics (12), but the incidence is too low to obtain a general attack rate.

In some epidemics, particularly those due to

staphylococci of phage type 80/81, skin infections among the staff are very common (13).

Air Hygiene in the Operating Room

The institution of the "wound book" for recording the incidence of postoperative sepsis led Shooter and his colleagues to an elegant study on air hygiene in the operating room (8). Over a period of 8 months, 9 percent of clean surgical wounds developed postoperative sepsis, and the staphylococci from these patients fell into many different phage types. The operating room was at the top of the hospital and its ventilation was such that air was sucked into the room from the adjoining corridors and ultimately from the wards. It seemed likely that this air stream carried staphylococci from the wards into the operating room, where they could enter the wounds. This idea was confirmed when adjustment of the ventilation to provide a positive pressure of air within the operating room was followed immediately by a decrease of from 9 to 1 percent in the incidence of sepsis apparently due to theater infection. There was also a striking reduction in the number of bacteria found in the air of the operating room.

Blowers and his colleagues (14) had earlier studied an operating room in a thoracic surgi-

laxis and the use of an air-conditioned room for performing the dressings.

At about the same time Miles and I were investigating infections in small industrial wounds (6). Sepsis was usually due to staphylococcal infection, and the staphylococci were very commonly those carried on the patient's skin before the infliction of the wound. We thought that in these small wounds streptococci indicated hospital infection, staphylococci self-infection.

Any idea that this distinction would prove generally true was soon shattered when it was observed that penicillin-resistant staphylococci were becoming increasingly common in surgical wards, and that the resistant strains differed in phage type from the sensitive strains previously infecting the patients and probably did not arise as variants of them (7). The fact that staphylococcal cross-infection in the wards became evident when the staphylococci had acquired the mark of drug resistance has led some to think that cross-infection is a new phenomenon, characteristic of the drug-fast strains. I do not think there is any reason to believe this, although reliable statistics of incidence for pre-antibiotic days, as for the present, are difficult to find and to interpret.

Prevalence of Hospital Infection

Determination of the prevalence of hospital infection is the first question that faces us today. Generally, the incidence of sepsis cannot be satisfactorily discovered from a review of ordinary hospital case records. Several hospitals have therefore devised special sepsis records. The surgical unit at St. Bartholomew's Hospital in London keeps a "wound book" in the operating room (8). In this book all operations are recorded and it is noted whether the wounds are healing satisfactorily or developing sepsis.

Elsewhere similar records have been kept in the wards (9). Many hospitals have systems for reporting cases of infection to the laboratory or to an infection control officer, usually the hospital's medical bacteriologist, whose function it is to keep a special watch on all aspects of infection throughout the hospital. It is our feeling that systems that simply re-

quire notification of cases of infection are less likely to give complete records than those that demand recording of the outcome, whether infection develops or not. Most hospitals now have an infection control committee, which includes representatives of all the important departments within the hospital, and in many cases also includes the medical officer of health of the district in which the hospital is situated.

The development of these systems is relatively new, and little information has yet been published on the prevalence of staphylococcal infection. For this reason the Public Health Laboratory Service in England and Wales has instituted a survey of postoperative infection in selected hospitals in different parts of the country. All clean operations performed by one surgical team in each hospital will be observed for 1 year, and the mode by which wounds heal will be assessed jointly by the surgeon and the bacteriologist. Preliminary results from three hospitals, for example, show from 5 to 9 percent of clean surgical wounds developing staphylococcal infection with clinical sepsis (B. Moore and R. J. Henderson in personal communications). The rates for some of the other hospitals are mostly about 5 percent.

A number of surveys have also been made of the incidence, apart from epidemics, of skin sepsis in newborn babies. We made one such study in a maternity hospital 2 years ago and in a 6-month period found that 15 percent of the babies developed some staphylococcal lesion (conjunctivitis or skin sepsis) before discharge. Dr. M. H. Hughes, in an unpublished survey in a hospital in South Wales, found an incidence of 14 percent, but lower rates have been observed by others. The incidence of breast abscess is very difficult to determine because the disease so often develops after the patient's discharge from the hospital (even when this is at the 10th to 12th day as it is in Britain) and is treated by a different physician. Hughes found an incidence of 1 percent, and others have reported very similar rates (B. Wilkinson in a personal communication, 1958).

It seems that, even apart from recognized epidemics, 5 percent or more of clean operation wounds and 10-15 percent of newborn babies develop septic lesions due to staphylococci.

such nurse who started outbreaks in several wards in which she worked.

In our own studies in a surgical ward at St. Bartholomew's Hospital (10, 11), we thought that we could distinguish particular patients who were actually or potentially dangerous. For example, it seemed very likely that a sharp epidemic in 1956 was started by a patient with a staphylococcal pneumonia; he was probably the source of several ward infections and he may well have infected the member of the surgical team who became a carrier and certainly infected many patients at operation.

In later studies, we recognized a number of patients who were especially apt to disperse their staphylococci. In some cases there seemed to be a good reason for this aptitude, such as urinary infection with incontinence or pneumonia with a tracheotomy. But the individual who contaminated air to the greatest degree was a healthy carrier.

We were so impressed by the ability of some infected patients to disperse their staphylococci that we rigorously isolated in a separate room any patient infected by what appeared to be a dangerous staphylococcus, which we provisionally took to be one resistant to tetracycline. The physical isolation was, of course, supplemented by a very strict isolation-nursing technique, great care being taken that no material that had been near the patient was used in the ward without sterilization. On 6 separate occasions in 2 years of this regimen we have been able to isolate all patients with septic lesions as well as healthy carriers known to be infected with supposedly dangerous types. Only once did infection spread to another patient, probably because of a breakdown in the isolation. On one occasion when we isolated the septic patients but had insufficient space to isolate all the carriers, two secondary cases occurred; the strain was of phage type 80, which is known to be very communicable.

The isolation nursing of infected surgical patients has in general been curiously neglected; yet, when we see the extent to which infected patients can contaminate the ward, it surely seems ridiculous to nurse them among patients with susceptible wounds that have to be redressed daily. One of the most valuable contributions that hospital administrators can

make to the solution of cross-infection may well be the provision of really adequate isolation facilities in all wards, sufficiently equipped to simplify the routine of isolation nursing.

Spread of Infection in Maternity Wards

Although infection is commonly introduced into a maternity ward by a nurse who is a carrier, it seems clear that subsequent spread is often from one baby to another. In seeking the route of this spread, some have stressed the umbilical stump as a reservoir. It recently became fashionable to leave the stump uncovered, and it was easy to show that in these circumstances the stump became contaminated with staphylococci as or more quickly than the nose. Jellard (26) found that if the umbilical stump was painted daily with an antiseptic dye, the staphylococcus seemed to spread less readily through the nursery. Her studies, however, were confined to the rate at which newborn babies acquired bacteria. Gillespie (27) has had a similar experience with the use of a hexachlorophene dusting powder for the umbilicus. Cook, Parrish, and Shooter (28) studied a variety of nursing techniques for their effect on the rate of nasal colonization. Although they could not reduce the rate greatly by any method, they found the best to be the reservation of individual clean gowns for the nurse's use when handling each baby, coupled with the application of antiseptic dye to the umbilical stump. We have recently found that air disinfection with ultraviolet irradiation had no effect on the nasal colonization rate, but that daily bathing with soap containing hexachlorophene might be of some use. Forfar and MacCabe (29) could detect no effect on the incidence of minor sepsis when the nurses in one of two nurseries gave up wearing special gowns and masks.

Environmental Contamination

To the bacteriologist, the ease with which staphylococci can be isolated from ward dust and from bedding and curtains is inescapable. It seems inconceivable that such heavily contaminated material should not be a reservoir for the spread of infection to patients. This thought has prompted many attempts to eliminate the contamination. The wool blanket

cal unit in which suction ventilation led to the contamination of air in the operating room with ward staphylococci. As a consequence of these studies and of the still earlier work of Bourdillon and Colebrook (15), it is now accepted that when operating rooms are built within the hospital, they need to be ventilated under positive pressure to exclude contaminated air issuing from the hospital. The rate at which the air within the room is changed must also be great enough to insure that any contamination liberated at one operation is cleared before the next operation is commenced. This usually implies a rate of 10-20 air changes per hour. Blowers has been investigating the best ways of getting the required rate of air changes with the least expenditure of energy, and he has shown that it is advantageous to bring the air in at the ceiling in such a way that it tends to descend through the room in a piston fashion, rather than by inducing turbulent mixing (see chart). This piston ventilation can be achieved by proper design of the air inlets and, in some circumstances, by using the incoming air as the principal source of heating for the room. The change from turbulent mixing to downward displacement may have another advantage. With a really steady piston effect it may be possible to protect the sterile area to some extent from contamination dispersed by the staff even within the operating room.

In several reports, Blowers has stressed how the number and activity of the staff in the operating room affect the bacterial count of the air. He showed, in one instance, that training the staff to avoid all unnecessary movement reduced the count as much as improving the ventilation did (16, 17), though the source of contamination in the two cases is different. Blowers' observations and the recent work of Hare and his colleagues (18, 19) on the dispersal of staphylococci from contaminated clothing of nasal and skin (especially perineal) carriers of staphylococci stress the importance of a rule that all persons working in the operating room should change all their clothing (which is not by any means general in Britain) or should wear some special protective suit as suggested by Duguid and Wallace (20).

The operating room air can be contaminated by ward staphylococci not only by air streams

from the ward but also by blankets and the like used to cover the patient on his journey to the operation. It is best that the patient be covered with sterilized material sent to the ward from the operating room. If he has to be transferred from the operation table directly to his bed, this should not be done within the operating room itself.

Carriers in the Operating Room

Airborne infection in the operating room is probably not uncommon, but probably it is not often responsible for epidemics of sepsis. Several epidemics of operating-room sepsis have been traced to staff members who were dangerous staphylococcal carriers. In some instances the carrier had a septic lesion as did the surgeon described by McDonald and Timbury (21); in others the carrier was apparently quite healthy (1, 22). Knowing how widespread the staphylococci are on the skin of anyone with a septic lesion and knowing the frequency of accidental glove-puncture during surgery, it is not surprising that a surgeon with a boil infects the patients on whom he operates. The healthy carriers present a much greater problem, because we know that some 50 to 70 percent of all hospital staff carry staphylococci in the nose and 20-40 percent carry them on the skin. Why then do they not cause epidemics more often? It may be that some carriers are qualitatively different from others: the surgeon described by Devenish and Miles (1) seems to have been a particularly profuse carrier on the skin of his forearm. Or it may be that the staphylococcus has to be virulent: the carrier described recently (10) certainly had a staphylococcus of more than average virulence, as judged from its behavior in the ward.

Carriers in the Wards

The peculiar ability of some individuals to spread their staphylococci has also been recognized as responsible for the spread of infection in wards. In maternity departments there have been several outbreaks of infection (23, 24) in which a single nurse who was a carrier of the epidemic type of staphylococcus seemed to be responsible for many cases of infection, and Jellard (25) has recently referred briefly to one

patients who developed postoperative sepsis, and 7 of them were nasal or skin carriers of staphylococci before the operation. One might think that when we reach the stage at which we can attribute so much of the postoperative infection to the patients' own preoperative staphylococci we may be nearing our goal. But we need to beware, for patients who are in hospitals for any time before an operation often become nasal carriers of the hospital staphylococcus (37) and this hospital strain may be the one that infects the wound.

The records of the staphylococci sent to us at Colindale for typing reveal an interesting fact on the frequency of carriers among the staff. In 4 years we typed material from staff and patients in 94 separate epidemics. Altogether about 18 percent of the staff carried the type of staphylococcus that was locally epidemic, but there was a striking difference between epidemics due to staphylococci of phage group 1, with some 25 percent of the staff who were carriers, and those of other phage groups, with 3-13 percent carriers (see also 38). The notorious type 80 (or 80/81) did not differ in this respect from other types in phage group 1. Apart from type 80, which occurs in all sorts of hospitals, phage group 1 strains are not often epidemic outside maternity hospitals. The results suggest that widespread nasal carriage of the epidemic strains among hospital staffs is not common enough to justify general nasal disinfection as a routine and that it is more likely to be relevant in maternity hospital outbreaks than in outbreaks in surgical wards, unless the infecting strain is type 80.

Chemoprophylaxis and chemotherapy of the wounds have been widely used, but too rarely precisely assessed; and only in the management of burns has a serious attempt been made to integrate antibiotic treatment with the work on the prevention of cross-infection (39). There is a great need for more detailed work to discover just what can be prevented by prophylaxis, and to what extent treatment can, at least, prevent an infected wound from being a dangerous source of cross-infection.

Epidemic Types of *Staphylococcus aureus*

It used to be thought that all strains of coagulase-positive staphylococci were similar in

virulence, but this idea can certainly be held no longer. On the other hand, the recent world-wide spread of one type known as 80, or 80/81 (or 52/44A/42C/47C, and the like), has led some to think that it is only this strain that is important and strains of all other types can be neglected. This idea is likewise quite untenable.

Our studies in the surgical wards emphasized the different capabilities of different strains of staphylococci. From all sites in the ward, in an 8-month survey, some 186 different strains of *Staphylococcus aureus* were isolated, but only 13 of these caused disease, and only 3 caused disease in more than 1 patient. Some strains seemed to have remarkably little virulence. One was present in the air of the ward, often in large numbers, for 6 months, but never caused a secondary case of sepsis and only colonized 3 patients' noses. Another was present in the ward for 8 months without causing any secondary cases of sepsis, although it colonized the noses of 57 persons. In contrast, the strain present in the same ward in the previous year caused 34 cases of wound sepsis and other disease in a 2-month period. It was widespread in the air and dust, but it colonized only two noses.

I have made an analysis of the phage types of staphylococci from septic lesions sent to Colindale in the 4 years 1954-57. Altogether we had 1,131 independent strains (counting all the strains from any one epidemic as one strain), 638 from surgical units and 493 from maternity units. A great many different types could be recognized, but some 20 types or groups of closely related types were each represented by 10 or more strains. Among the 1,131 independent strains, 178 were, in the particular time and place, epidemic strains, and 69 percent of these were found in no more than 7 types. Type 80 had the highest proportion of epidemic strains. This type was equally common in maternity and surgical units; but other common epidemic types were 52A/79 and 71 in maternity units and 75/77, 47/53/75/77, and 7/47/53/54/75 in surgical units.

In Britain, as elsewhere, type 80 has spread rapidly in the last few years; at Colindale we had specimens from 5 or 6 epidemics in each of the 3 years 1954-56, and from 21 epidemics in

offers the greatest problem, for dust and fluff are readily dispersed from its surface, and ordinarily it is laundered at too low a temperature to kill staphylococci. Indeed washing is so harmful to blankets that it has commonly been practiced as rarely as possible.

As a legacy from earlier work on streptococcal infection we had the method of oil impregnation of wool blankets to prevent dispersal of the bacteria, without killing them (30). Later Blowers and Wallace (31), following earlier work by Rountree and by Barnard, devised a simple method for disinfecting wool blankets during laundering, using a nonionic detergent for washing and a cationic detergent for disinfection. This process, which effectively kills staphylococci—though not *Pseudomonas pyocyanea* or *Mycobacterium tuberculosis*—and which does little harm to the blankets, has been quite widely adopted. Other methods are also being investigated by which wool blankets can be disinfected safely.

But clearly a blanket that could withstand the laundry temperatures used for linen and cotton material would have great advantages. Blowers, Potter, and Wallace (32) tested three materials: loose woven cotton, thick toweling, and Terylene, all of which can be boiled. Both cellular cotton and the toweling make good blankets and can be recommended.

It is therefore perfectly possible to provide patients with sterilized bedding, but it is still not known just how much good we may expect to do by this. The effect of sterilized bedding on the air contamination in the wards has been tested somewhat, but there is very little work yet on the incidence of sepsis. Nevertheless, the general view seems to be that it is undesirable to harbor in the ward a large pool of staphylococci on blankets and curtains and that their regular disinfection is likely to reduce the incidence of sepsis.

We have made several studies of the bacterial content of the air of a surgical ward (11). We found a basal level of about 0.1 particle containing *Staphylococcus aureus* per cubic foot. Much higher counts (0.5 to 5.0 particles per cubic foot) were found, even during relatively quiet periods in the ward, when one of the patients was an active disperser, but such high counts were not constantly associated with the

occurrence of cases of sepsis due to spread within the ward, although it is true that a peak occurred whenever spread took place.

Treatment of the Carrier State

The inanimate hospital is an enormous reservoir of staphylococci derived from infected patients and from carriers, but staphylococci do not multiply in dust or on bedding and it seems more rational to attempt to control dispersal by an attack on the breeding places rather than on the resting places. Gould (33, 34) has made a series of studies of the antibiotics and disinfectants applied to the nose to eliminate the carrier state. He finds that applying a cream containing, for example, 0.5 percent neomycin and 1 percent chlorhexidine (Hibitane) for 7 to 14 days rids most carriers of detectable nasal staphylococci for a period of a few weeks. This method used by several workers has often been successful for treating nurses who have become carriers during an epidemic (35), but some carriers seem to be quite resistant to this form of treatment, even though their bacteria are sensitive to the antibiotic in vitro. Gould and Allan (36), working on the assumption that hospital infection with staphylococci was derived from carriers among the staff, treated all the staphylococcal nasal carriers on the staff of a small hospital with a tetracycline cream for 1 week and found that the incidence of hospital infection decreased strikingly during the period following this treatment. On the other hand, Gillespie (27) has proceeded on the assumption that the patients are (or become) nasal carriers and infect their own wounds. He therefore applied an antibiotic cream to the patients' noses from the time of their admission to the ward and throughout their stay, and the frequency with which staphylococci were isolated from open wounds fell from about 15 to about 3 percent. The incidence of clinical sepsis was not reported.

Clearly, these two concepts need further study. In our first year's work in the surgical ward at St. Bartholomew's, Dr. Shooter and I could find no evidence that the wound infections were derived from either the patients' or the staff's noses; infection seemed to be from one infected patient to another. On the other hand, during the past year we have studied 15

helped by a laboratory test of virulence so that the potential initiators of epidemics could be isolated. Otherwise, it seems that our only hope is to regard all persons, whether surgical patients, babies, or staff, with staphylococcal lesions as having virulent strains, and to treat them in strict isolation as one would cases of infectious disease. It would also be wise, when possible, to isolate known carriers of strains resistant to many antibiotics. The hospital also needs to have a recording system sensitive enough to recognize quickly any increase in the prevalence of infection and someone with clinical authority to scrutinize the records and initiate the investigations that may be able to stem an epidemic.

Of general preventive measures, the aseptic handling of patients should receive the greatest stress. Every staff member's approach to the patient must be informed by a realization of the infectiousness of staphylococcal infection. Everything taken from the infected patient must be sterilized, and all material used for the treatment of all patients must not only be sterilized but must be kept sterile right up to the time that it is used. The provision of proper facilities and equipment is an essential contribution from the administrators; the rapid and detailed recognition of the infecting bacteria is the duty of the laboratory; but there are no gadgets and no drugs or vapors that can relieve the people who handle the patients of their perennial responsibility for handling them aseptically.

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1957. Thirty percent of all the strains that we had from septic lesions in 1957 proved to be type 80, although this figure may be somewhat inflated by the general interest shown in this particular type. But even now, quite extensive epidemics due to other phage types are being seen.

Practically all the staphylococci responsible for epidemics are resistant to penicillin and most are resistant to other antibiotics as well. It is possible that by now selection by antibiotic treatment has increased the proportion of virulent strains as well as of antibiotic resistant strains, but I do not think there is good evidence that the resistant strains of today are fundamentally more virulent than the sensitive strains of yesterday. If the use (or misuse) of antibiotics has increased the incidence of staphylococcal cross-infection, this is more likely to be due to our reliance on drugs instead of asepsis for preventing infection, rather than to any malign effect of the antibiotics in selecting especially virulent staphylococci. If there were no cross-infection, the development of drug resistance would have a relatively limited importance.

Conclusion

Although some progress seems to have been made in understanding what happens in hospitals, it is clear that much remains to be done. In the laboratory, especially, factors related to virulence need to be explored and in the wards all the numerous measures that are advised for the prevention of cross-infection need to be more precisely tested. For it is certain that if we prescribe too many rules their observance will be neglected.

In my opinion there is no one way in which staphylococci spread in a hospital, and there is no one prophylactic method by which spread can be prevented. The routes of infection are numerous and probably often devious, and the precautions needed are many and often complex.

Staphylococcal hospital infection is an infectious disease, with this subtlety, that while most staphylococci are, when given the best opportunity, able to produce septic lesions, relatively few of them seem able to produce

epidemics. Probably all hospitals have their endemic level of staphylococcal infections, while some, from time to time, suffer epidemics. Our preventive measures have therefore to minimize the endemic level, to prevent the emergence of epidemics, and to terminate epidemics when they occur.

It seems probable that an epidemic is usually started when an especially virulent staphylococcus is introduced into a hospital by someone who is able to disperse it readily. If we are prepared to try, it should not be too difficult to recognize people who are likely to disperse the bacteria, but we have at present no satisfactory measure of the virulence of staphylococci other than the retrospective record of what a particular strain has achieved. There is some correlation of epidemicity with phage type, but we know of many introductions of well-known virulent types into hospitals with no subsequent spread. Perhaps this means that they were not being dispersed sufficiently, or very likely there may be variations of virulence within the type. The combination of two factors, virulence and dispersal must be present; but we must hope that these two, although necessary, are not sufficient. Our preventive measures ought to be such that we can limit the spread of virulent strains, even from the profuse dispersers.

When an epidemic has started, the best approach to control it is to attempt the elimination of the epidemic strain from the hospital. This means, first, definition of the type of staphylococcus that is causing infection in the patients, and, second, a search for carriers of this type in the hospital personnel or patients. Sometimes such a search will reveal the one dangerous carrier whose exclusion terminates the epidemic. Often the search will reveal several carriers. Even though it may be possible to judge from epidemiological analysis that one is important in an epidemic of any severity, it is worth treating or excluding all of them. These searches, with the examination of fomites and the typing of all staphylococci, will often exceed the facilities of the hospital laboratory. Outside agencies, such as public health laboratories, should be equipped and ready to help in these investigations, and their help should be readily sought by the hospitals.

The prevention of outbreaks would be greatly

Prevention of chronic disease, services for long-term patients, and social programs related to their health were discussed at a recent meeting held by directors of State chronic disease programs and the Subcommittee on Long-Term Illnesses and Aging of the Association of State and Territorial Health Officers at the University of Michigan, Ann Arbor. Of the 20 papers delivered, 4 have been selected for publication here in slightly revised form.

Progress in Control of Chronic Disease

DAVID SEEGAL, M.D., and ARTHUR R. WERTHEIM, M.D.

THE MEDICAL profession's awareness of the preventive aspects of chronic illness is just coming of age. Much has already been written and said about this subject; many committees and public health agencies have pressed home salient points; and the current state of our knowledge in the field has been treated comprehensively in the volume, *Prevention of Chronic Illness*, issued in 1957 by the Commission on Chronic Illness. The impetus of past efforts now finds expression in the general acceptance of the belief that chronic disease represents the most important problem facing medicine today and in major breakthroughs in the primary or secondary prevention of certain long-term diseases. (In primary prevention, the occurrence of a disease is averted; in secondary prevention, the progression of a disease from its early, unrecognized stage to a more severe stage is halted.)

In discussing chronic diseases with physicians and medical students we find there is a common tendency to consider as chronic only

those long-term diseases not yet subject to specific treatment or to primary or secondary prevention. This attitude naturally fosters a pessimistic outlook.

Man's memory can be short and the physician is not exempt from this frailty. In the field of acute diseases, our students have to be reminded that in New York City alone there were 166 deaths from yellow fever in 1822, 5,071 deaths from cholera in 1849, and 552 deaths from typhoid fever in 1911.

The physician's memory of the advances in prevention and control of some long-term illnesses is beclouded and often dominated by our present inadequacies rather than by our past accomplishments. Unwittingly, he gives too little thought to the chronic diseases which are now preventable or controllable. These diseases represent scientific battles already won even though the strategy and tactics of the clinician and the public health officer are still required to implement the measures for their control.

Just what are these diseases? In 1949, my associates and I compiled a list of representative chronic diseases that were largely controllable, partially controllable, or uncontrollable (see table 1).

Some changes in classification might be made at this date, and some additions should be made. For example, retrolental fibroplasia should be added to the largely controllable group; dental

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Sanitary Engineering Courses in Radiation and Water Analysis

A course in sanitary engineering aspects of nuclear energy will be conducted at the Robert A. Taft Sanitary Engineering Center, Public Health Service, in Cincinnati, Ohio, December 1 through 12, 1958. Designed for engineers and scientists in public health, especially those in supervisory posts, the course covers the broad aspects of radiological health.

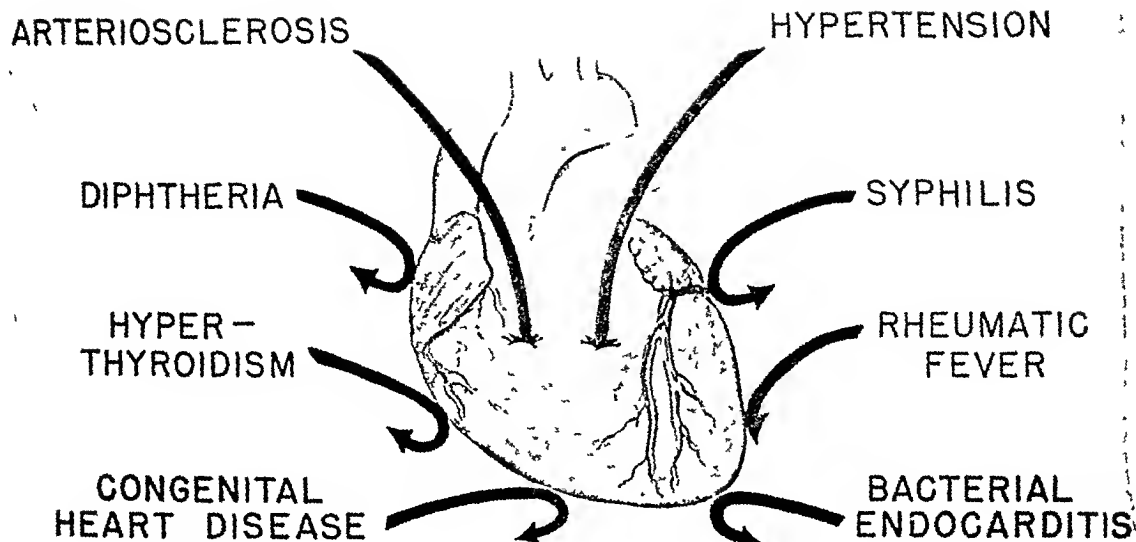
The program opens with a discussion of radiation fundamentals and instrumentation, then focuses on radiation protection, nuclear reactor operations, and measurement and evaluation of environmental radiation contamination.

During the same 2-week period, the center will give a course in chemical analyses for

water quality, for graduate chemists and professional people with extensive background in water supply and water pollution control.

Among subjects covered are: measurement of strength and effect of oxygen-demanding wastes; investigation of toxic industrial wastes, including the determination of toxicity through bioassay; characterization of synthetic organic wastes; water supply problems; and survey and administration, including basic data program.

Applications may be obtained from the Chief, Training Program, Robert A. Taft Sanitary Engineering Center, 4676 Columbia Parkway, Cincinnati 26, Ohio, or from a Public Health Service regional office.



Progress in the Control of Heart Disease

which attracted the physician's attention and care. Today the "beginnings" of long-term disease are being revealed to the doctor because of painstaking clinical, physiological, biochemical, pathological, and epidemiological studies. This new knowledge must perforce accelerate the rate of development not only of therapeutic but also of preventive measures.

Evidence now indicates the need for reappraisal of the concept that the so-called degenerative diseases of middle life are initiated about the age of 40. The average age of onset and the minimal age of onset of clinical illness (symptoms or signs) for a few of these disorders are shown in table 2. Although organ failure may be generally manifested in middle age, the data support the belief that some chronic illnesses may be recognized in early life.

Table 2. Approximate age of onset of clinical symptoms of some representative chronic diseases

| Disease | Average age | Minimal age |
|---------------------|-------------|-------------|
| Gout | 40 | 6 |
| " | 32 | 9 |
| " | 56 | 26 |
| " | 38 | 10 |
| Laennec's cirrhosis | 55 | 2 |
| Multiple sclerosis | 28 | 5 |

Certainly this belief would apply to those congenital diseases in which genetic factors are obvious. There are a group of diseases in which the hereditary influence is less clearly defined; nevertheless many observers hold that genetic factors play a role in such disorders as hypertension and coronary atherosclerosis, for example.

Be that as it may, recent additions to our knowledge support the opinion that the beginnings of a number of important chronic illnesses of middle and late life can be detected in early life (see table 3).

In some of the entities listed in table 3, it has been established that the early subclinical stage may exist for years prior to the development of overt clinical disease. Screening programs would detect the defect. When possible, preventive measures could then be brought to bear.

For example, the avoidance of obesity has been suggested as a useful primary preventive measure for siblings of diabetic patients. These recommendations are particularly advisable for such individuals when they have decreased glucose tolerance. The efficacy of a restricted carbohydrate diet in such patients to prevent clinical diabetes mellitus is now being explored.

Gamma globulin administration has proved to be a useful measure in preventing recurrent

caries, paralytic poliomyelitis, certain forms of glaucoma, and some instances of the nephrotic syndrome might be added to the partially controllable group.

Clinical findings during the past few years indicate that the malignant phase of primary hypertension may also be added to the list of partially controllable chronic diseases. Low sodium diets, sympathectomy, and, more recently, the antihypertensive drugs have extended the lives of some hypertensive patients. However, data on the influence of these forms of treatment on the uncomplicated phase of primary hypertension are less convincing and at present do not justify its addition to a list of therapeutic successes. Although atherosclerosis appears in the group of uncontrolled chronic diseases, extensive laboratory, epidemiological, and clinical investigations suggest that a breakthrough may not be too far distant.

These advances have occurred in recent years. In my student days, our teachers told us there were no effective methods to control significantly such long-term diseases as diabetes mellitus, pernicious anemia, tuberculosis, any form of congenital heart disease, sprue, cirrhosis of the liver, Addison's disease, or rheumatic fever. That picture has changed and is continuing to change favorably.

These facts seem worthy of reemphasis because of some recent divergent opinions. Although the former Surgeon General of the Pub-

lic Health Service, Dr. Leonard A. Scheele, has expressed the view that the solution of critical problems in chronic disease is much nearer than is generally recognized, his optimism is not shared by all. Dr. Lowell T. Coggeshall, for instance, has been quoted as stating that "progress against chronic illness and disability is disappointingly slow."

In our view it has been surprisingly rapid. For example, witness the progress made in the control of heart disease since the turn of the century. The accompanying chart lists the eight chief causes of past and present cardiac disorders. The deflected arrows symbolize increasing control in 6 of the 8 diseases; hypertension and atherosclerosis remain.

As a fourth-year medical student, I remember seeing a child who was believed to have three disorders of the heart: a congenital lesion which I think was a patent ductus arteriosus, inactive rheumatic heart disease, and *Streptococcus viridans* endocarditis.

I wonder what would have happened if, at that time, I had asked my instructor whether each of these three diseases would be amenable to prevention or control during my lifetime. My guess is that my name would have turned up on the dean's desk with a request for a psychiatric examination.

Another aspect of prevention is the age of onset of many chronic diseases. In the past it was chiefly the "endings" of chronic illness

Table 1. Status of chronic diseases, 1949

| Largely controllable | Partially controllable | | Largely uncontrollable |
|-----------------------------|----------------------------------|------------------------|-------------------------------|
| Diabetes mellitus | Congenital heart disease | Cretinism | Certain congenital defects |
| Syphilis | Addison's disease | Diabetes insipidus | Certain neurological diseases |
| Hyperthyroidism | Certain neuroses and psychoses | Gout | Certain psychoses |
| Myxedema | Aeromegaly | Coeliac disease | Certain neoplasms |
| Hyperparathyroidism | Hemophilia | Lung abscess | Chronic glomerular nephritis |
| Sprue | Bronchiectasis | Hay fever | Hypertension |
| "Alcoholic" neuritis | Trypanosomiasis | Erythremia | Arteriosclerosis |
| Pellegra | Tuberculosis | Actinomycosis | |
| Beriberi | Osteomyelitis | Rheumatic fever | |
| Scurvy | Rheumatoid arthritis | Asthma | |
| Rickets | Myasthenia gravis | Myotonia congenita | |
| Hookworm infestation | Familial periodic paralysis | Epilepsy | |
| Malaria | General paresis | Bacterial endocarditis | |
| Amebiasis | Disseminated lupus erythematosus | | |
| Thrombocytopenic purpura | | | |
| Familial hemolytic jaundice | | | |
| Pernicious anemia | | | |

Public Health and Chronic Disease

THEODORE J. BAUER, M.D.

DURING the past 10 years the responsibility of State and local health departments to participate in control of the chronic diseases has been adequately established. During this period private physicians also have recognized their responsibilities to the chronically ill, and have made many notable contributions to early treatment and rehabilitation in order to lessen the severity of complications.

The most encouraging phenomenon during the decade of progress now ending has been the way in which private physicians and public health workers have accepted the fact that no definite means for preventing many of the chronic, noninfectious diseases has yet been developed. Instead of being discouraged or dismayed by this fact, teams of private physicians and health officers have turned to the practical task of extending activities and services designed to prevent or minimize disability in chronically ill patients and to prevent premature death.

A tremendous long-range research program has also been organized in this country, aimed at unmasking such secrets as the causes of cardiovascular diseases, cancer, and mental illness.

No one over 40 is free from some degree of disability caused by either an inherited weak link in the chain of organ systems or by the ravages of premature but otherwise to-be-expected physiological decline.

As Dr. Enrico Greppi, president of the International Gerontological Society, said at the fourth congress of the society, held in Merano, Italy (July 1957), "Old age can be considered a disease consisting of deficiencies and illnesses."

Dr. Bauer, an Assistant Surgeon General, is deputy bureau chief, Bureau of State Services, Public Health Service.

Dr. Greppi estimated the average age of onset of this "disease" to be 45.

Since every individual then has a built-in "time bomb," which must cause his eventual destruction, it would seem futile to attempt to prolong "life" indefinitely, if by "life" we mean the mere act of existence. Instead, we should accept the physiological and theological premise that mortal life is meant to end and concentrate our primary attention on the prevention or postponement of disability. We should aim at maintaining as long as possible a productive state of adjustment to a necessarily imperfect existence.

This concept or approach to the problem of chronic illness frees us from the stultifying inhibitions unwittingly imposed upon us by perfectionists. Many types of cancer and heart disease are admittedly still incurable, but this should not slow down our efforts aimed at early detection of such diseases. We can help many by such work; we can help no one by refusing to undertake such work. Our duty is clear.

We can move ahead against the chronic diseases one by one now. We can move ahead now against that complex of chronic diseases loosely lumped under the heading "aging." We can apply now what we know about secondary prevention and rehabilitation, at the same time that scientists are pursuing their research into the fundamental nature of chronic diseases.

We are aware of the difficulties experienced by public health workers in State and local health departments in launching new programs. They are often handicapped by lack of funds, by lack of personnel, and by a lack of understanding of their problems on the part of the public, legislatures, and occasionally even physicians.

However, judging by the progress already

sepsis in patients with agammaglobulinemia or hypogammaglobulinemia. Early casefinding is necessary if available preventive measures are to be instituted.

Primary prevention is not yet possible for most diseases listed in table 3, but early casefinding will serve as a stimulus for further investigation. Some measures already at hand have not yet been tested adequately. For example, since penicillamine has been reported to be an agent for the removal of copper from patients with Wilson's disease, it might be worth a trial during the precursory phase of hepatolenticular degeneration to prevent increased levels of copper in tissues and thereby possibly influence favorably the course of the disease. Furthermore, it would be of interest to learn the results of long-term probenecid administration in those siblings of patients with gout who have hyperuricemia. Long-term programs have been instituted to study the effect of mild antihypertensive drugs in individuals with a family history of hypertension and who have a hyperreactive arteriolar vascular tree.

The course of action is clear. Disease can be detected in some instances before chronic illness is clinically manifest, and widespread efforts to discover individuals in these subclinical stages of disease are necessary. Progress is being made in the development of measures both for primary prevention of disease and secondary prevention after the disease is evident.

Table 3. Common precursory findings in some representative chronic diseases

| Common precursory findings | Clinical disease |
|--|-------------------------------|
| Hyperuricemia----- | Gout |
| Cystinuria----- | Renal calculi |
| Decreased glucose tolerance-- | Diabetes mellitus |
| Achlorhydria----- | Pernicious anemia |
| Agammaglobulinemia----- | Recurrent sepsis |
| Serum iron excess----- | Hemochromatosis |
| Pernicious anemia----- | Gastric carcinoma |
| Vascular hyperactivity----- | Primary hypertension |
| Prenatal viral infections----- | Congenital anomalies |
| <i>Streptococcus hemolyticus</i> pharyngitis----- | Rheumatic fever |
| Silicosis----- | Pulmonary emphysema |
| Intestinal polyposis----- | Carcinoma of the intestine |
| Cystic fibrosis of the pancreas | Chronic respiratory infection |
| Heavy cigarette smoking---- | Bronchogenic carcinoma |

Conclusions

Primary and secondary preventive measures for chronic diseases are being discovered and used with encouraging frequency.

Primary prevention is effective in such representative diseases as syphilis, tuberculosis, malaria, rheumatic fever, pellagra, anebiasis, certain forms of neoplasm, and a wide variety of illnesses associated with industrial agents.

Secondary prevention can be practiced to lessen the delayed pathology and disability which results from, for example, unmanaged or mismanaged syphilis, tuberculosis, rheumatic fever, pellagra, pernicious anemia, diabetes mellitus, and hyperthyroidism.

Epidemiological, clinical, and experimental studies on such matters as the relation of cigarette smoking to lung cancer and the role of dietary fat in human atherosclerosis are now opening possible avenues for prevention not commonly appreciated 20 years ago.

A critical review of existing knowledge indicates that in the great majority of instances the presence of chronic disease long antedates the appearance of clinical illness.

This is obvious in hereditary disorders. For example, hyperuricemia is present years before the appearance of clinical gout, and cystinuria exists long before the development of renal calculosis.

A similar "silent" or "latent" period exists in other long-term disorders (not commonly considered genetically influenced) such as hypercholesterolemia prior to the development of clinical atherosclerosis, heavy smoking before the appearance of bronchogenic carcinoma, pernicious anemia before the development of gastric carcinoma, and serum iron excess prior to the emergence of clinical hemochromatosis.

Although there is a wide range in the years in which chronic illness is first recognized, there is abundant evidence that careful clinical study will disclose the incipient stage of many chronic disorders at a much earlier age than is generally appreciated.

Since preventive measures, if available, exert optimum effects in the early and often reversible phases of chronic disease or illness, it is a matter of high priority to use preventive measures as early as possible.

to be the primary responsibility of local health departments. This responsibility includes collection of significant data needed for public education leading to public acceptance of important new local health services.

The Public Health Service is proud to be able to work with State and local health departments in making the vital transition from the control of infectious diseases to the control of noninfectious diseases and accidents.

FDA Screening for Unsafe Food Additives

Chemicals used in food processing must be proved safe by the industry before they can be sold for use in foods, under an amendment of the food and drug law enacted September 6, 1958.

Previously, the Food and Drug Administration had to prove such a chemical unsafe after the food was on the market and then bring court action to stop its sale.

Under the new law, which takes effect in March 1959, the manufacturer or promoter of the new additive must test it for safety in animals and submit test results to the Food and Drug Administration. If that agency is satisfied, it will issue a regulation specifying the conditions necessary for use. Those adversely affected by an FDA order may petition for a public hearing. An order emerging from such a hearing is subject to court review.

In addition to chemicals intentionally added to food, the law covers substances which may be expected to become components of a food or to affect its characteristics and which are not generally recognized as safe for their intended use.

For substances in use before January 1, 1958, and not generally recognized by experts as safe, industry has been given 18 months to present safety data in the absence of adverse evidence.

The law further prohibits additive use that would promote deception of the consumer or result in adulteration or misbranding. The amount of the additive fixed for use by FDA regulation will not be higher than the level required to accomplish the chemical's purpose.

The Food, Drug, and Cosmetic Act, enacted in 1938, when there were relatively few chemical food additives, required the Food and Drug Administration to discover the use of "poisonous or deleterious" additives in processed foods and to prove them injurious before action could be taken to protect the consumer. Since then, knowledge of food processing chemicals and the number of additives have advanced considerably. Testing of new additives by the Food and Drug Administration, normally requiring at least 2 years, became unrealistic in the face of a flood of new products both in use and under consideration.

Another aspect of the 1938 law was that any amount of toxicity sufficed to disqualify any chemical which could not be shown to be "required in production" or "unavoidable under good manufacturing practice." This was also unrealistic. Now the Food and Drug Administration evaluation of the safety of an additive requires considering among other factors the conditions of use, amounts used, and other related additives which may be used. As a result, many useful chemicals will be permitted if they are safe when used properly.

made in chronic disease control these handicaps can be overcome, perhaps slowly, but they can be overcome. That is the important thing.

The \$3 million increase in general health grants-in-aid to States, made available by Congress for distribution by the Public Health Service, is encouraging evidence that public recognition of the importance of the chronic disease problem has broadened. With these funds, health departments can begin demonstrating to the public the value of secondary prevention and rehabilitation. Once soundly conceived local projects are developed with Federal and State assistance, local citizens themselves will accept the responsibility for seeing that such projects are continued.

What types of projects can be started? Following are several examples that already are underway in certain States:

1. In one large midwestern city a substantial local appropriation recently was made to improve diagnostic facilities for children with rheumatic fever and to provide a mechanism for the antibiotic, prophylactic treatment of the disease to prevent the development of rheumatic heart disease.

2. In a large eastern State, the State health department has obtained chronic disease funds for local distribution. These funds, plus Federal funds, are being used to stimulate and partially support for 3-year periods a host of locally conceived projects such as screening programs in hospitals, establishment of rehabilitation services, development of home care or home nursing programs, diabetes detection, and alcoholism clinics.

3. In California, a local health officer is co-operating with the local welfare department and medical society in providing certain preventive medical services for persons who apply for old-age assistance. He is applying a modification of an old adage: "A penny for prevention is worth ten dollars for cure."

The list of such projects is almost endless: glaucoma detection, meals-on-wheels for homebound oldsters, nutrition consultation for the chronically ill, and cytological screening examinations for cervical cancer.

We are aware that no matter how badly a local public health service is needed, no matter

how logical the service may appear to be, and no matter how tangible the benefits from such a service are, the service will not be accepted overnight. Adequate education must prepare for the introduction of such programs. The skeletons of many worthwhile local chronic disease projects litter the public health trail—the skeletons of projects which were offered to local people who were psychologically unprepared to accept them.

There is one worthwhile activity that State and local health officers can engage in which will tend to prepare people for new local chronic disease projects. It is an activity that is sometimes neglected in our haste to get projects underway. I refer to the need to determine on a communitywide basis the types of illness which exist and the quantitative and qualitative importance of these illnesses. Although it is widely recognized that the diagnosis and treatment of persons afflicted with a noninfectious disease is the primary responsibility of private physicians, nevertheless private physicians do not have the means at their command to determine public health priorities for a community.

It is true that the advice of local and State public health councils and advisory committees, in which private physicians play an important role, must be sought in establishing public health priorities. Still, the data collection and analysis upon which the establishment of priorities depends must be accomplished by the State or local agency designated to do this job, namely, State and local health departments.

Should a local health department determine, as a result of a community health analysis, that heart disease is the number one health problem in the community, then it would not only be logical but essential for the local health officer to present the problem of heart disease as he sees it, in all of its ramifications, to the local medical society. The health officer at that time can pledge the assistance of his staff to the local medical society in developing or administering any project they may agree upon.

Although the diagnosis and treatment of the patient with a noninfectious disease continues, as always, to be the primary responsibility of private physicians, the diagnosis and treatment of "community illnesses" continues, as always,

not by the chronically sick. These views lead to the greatest misconception of all—that good care for the chronically sick is cheap.

These erroneous impressions have arisen because we have tried to lump together all chronic disease in the same way that we generalize about all acute disease. The difficulty lies in the fact that, for medical care purposes, acute illness has only one stage while chronic disease has several. These are, first, the active or acute phase which requires definite diagnosis and the application of definitive therapy, and, second, the rest of the natural course of the disease.

When we discuss medical care needs, facilities, personnel, and costs we must specify whether we mean the active, acute, first phase, with its great demands for highly skilled physicians and many other professional and technical people and resources, or the second phase, with its lesser demands on facilities and personnel and, therefore, lower cost.

When a chronic disease hospital has low per diem rates, 1 of 2 circumstances prevail: if the patients are really sick enough to require hospital care, then they are not getting the kind of medical care they require; if the patients are getting the care they need at this low cost, then their needs must be primarily nursing or custodial, and the use of the term "hospital" is misleading. High-quality, intensive hospital care for the active phase of chronic illness costs at least as much as care for the acutely sick. The reason is clear. In order to determine or apply definitive therapy it is necessary to establish an accurate diagnosis. The diagnosis of chronic illness requires the most complex laboratory facilities, the widest range of procedures, and the most difficult and expensive X-ray examinations. For example, the X-ray procedures for diagnosing lobar pneumonia and fractures of the long bones are simple compared with those necessary to diagnose a congenital abnormality of the heart or a tumor of the brain.

Diagnosis, particularly in older people, is also difficult, because often more than one important diagnosis is involved. It is not uncommon that a patient with a tumor of the bowel may also have atherosclerosis, hypertension, or other such complications.

The same complexity prevails in the application of definitive therapy. When a healthy person is suddenly struck down with an acute illness, the treatment is often obvious, and the patient's undiminished resources can be relied upon to help him through the period of acute stress and illness.

But a patient with chronic disease is likely to be older and more debilitated and beset by complicating conditions. For example, operating for carcinoma of the bowel on a patient in his fifties or sixties requires particular care in the use of anesthesia because the patient's vital capacity may be less than it once was. His heart and blood vessels are not as supple as they were, and this must be considered when it is necessary to replace body fluids. Injudicious use of blood and fluids can lead to acute heart failure in a patient undergoing such major surgery.

In our experience at Montefiore Hospital with the complicated surgery needed by patients with chronic disease, whether it be surgery of the lungs, abdomen, or heart, we find it essential that physician anesthetists be used because such operations are always difficult and the patient's hold upon life is so delicate.

The need for the most expert skill applies equally to the surgeon, the internist, and everyone in the specialties and subspecialties of medicine. Chronic disease batters and beats its victims. All too often we first see the patients when the disease is well along, or on a second or third or even tenth or twelfth hospital admission. Their persons, their tissues, their spirits must be handled by the most gentle and the most proficient.

The requirements of great skill also extend to nursing. Without good nursing, a patient with a neurological disease or a fractured hip can become a patient with bedsores or infections which threaten his life or at least his well-being. The nurse's responsibilities include maintenance of the patient's nutrition, carrying out complex treatments, participating in the rehabilitation of the patient, utilizing the special relationship to encourage the patient in the difficult adjustment to serious illness, and many more such vital tasks. These make the care of the sick, debilitated patient with

Patient Services in Chronic Diseases

MARTIN CHERKASKY, M.D.

THE HEALTH and medical care resources and facilities generally available in our country were developed in response to the demands of acute illness. It is now inevitable and desirable that these same resources be directed toward the demands of chronic illness, which has become the main preoccupation of those in the public health and medical care fields. In determining the changes in philosophy and facilities which our medical resources must undergo to deal with this new problem, it may be worthwhile to contrast the characteristics of the acute illnesses which have occupied us in the past with those of the chronic illnesses which will occupy us in the future.

The most obvious characteristic of acute illness is dramatic onset. The healthy individual develops signs and symptoms such as sharp pain, high temperature, or coughing of blood which make clear to the patient, to the family, and to the physician that serious illness is present. In acute disease the length of illness is usually brief, most often measured in days, and the illness is marked by a crisp, definitive end point. Most often the patient makes a complete recovery, returning to good health and the activities, pursuits, and responsibilities which characterized his life before the acute illness. The characteristics of most serious chronic diseases are so different as to be almost the obverse side of the coin.

The onset of many of the chronic diseases is so insidious that often the individual will not clearly recognize that there is anything seriously wrong with him. There is no qualitative relationship between the presenting symptoms and the severity of the underlying disease.

Diabetes is a very serious illness whose sequelae are disabling and often deadly. We are all familiar with the damage to the cardiovascular system which leads to heart disease, kidney failure, gangrene of the extremities, blindness, and other complications of diabetes, and yet it is commonly stated that more than a million Americans who have the disease are not aware of it. The reason is obvious; the initial symptoms may present such small deviations from the normal that neither the patient nor his family knows that anything is seriously wrong.

By definition the duration of chronic illness is measured not in days but in weeks, months, and years. Again in distinct contrast to acute illness, chronic disease usually does not have a sharp end point with complete recovery; more often disability and handicap remain for life.

The problems that face the individual, his family, and society in the care of the chronically ill are due to insidious onset, long duration, and disability.

Medical Problems

To determine the kinds of hospital and related facilities required for the care of the chronically sick, we should closely examine the medical, nursing, and other areas of patient need. The view of chronic disease held by the general public and even by some physicians is colored by a number of misconceptions such as: chronic disease is indolent; not much can be done for a chronically sick person; the chronically sick can be cared for in lesser facilities; not as much or as high-quality doctors' care is needed for the chronically sick as for the acutely sick; the most costly and complex resources are needed by the most acutely sick and

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you who are concerned with planning for the care of the chronically ill in a community close your eyes and dream this dream: Your community has no facilities for these people, and you can have any you believe necessary.

We all know that we will wake to the reality of facilities in the wrong place or of the wrong kind, and we must work and live within this reality. However, this exercise of imagination has concrete value. It is essential that the planners in every community have a blueprint, a dream, in keeping with the town's own cultural characteristics, needs, and resources, to show them where they should be going. Then as opportunities present themselves, they can move toward this ideal with a logical, planned program.

What are the facilities a community needs to care for the chronically sick?

1. A good general hospital with a broadened philosophy, providing not only doctors' care and nursing service but the services of social workers, and facilities for recreation, rehabilitation, and occupational therapy. In this hospital patients are not classified as acute or chronic but are cared for as their needs match the hospital's resources.

The hospital patient is a patient who requires definitive diagnosis and definitive therapy. Any patient who does not fit these criteria must be cared for elsewhere. This practice will insure that the hospital bed is used for its stated purpose. In effect hospitals should be, in toto, intensive care units. This can be brought about only by providing other institutions to which patients can be transferred when they need medical and nursing care less extensive and intensive than that provided in the modern general hospital.

2. A home care program for those patients who still require medical, nursing, and related care but who no longer require the specialized resources of the hospital. In the Montefiore Hospital home care program we have, by design, selected only patients who are quite sick, and for them we emphasize the role of the physician, the nurse, and the social worker in caring for them. We have recently undertaken, in conjunction with the Beth Abraham Home, a custodial institution, a somewhat dif-

ferent type of home care program for custodial patients. The emphasis and major cost of this program center around housekeeping and homemaking services rather than doctors and medical care.

3. The nursing home, preferably on the grounds of the hospital and certainly under the hospital's auspices for medical care and medical care supervision. This is a facility where patients, after completing the active phase of hospitalization, stay for days or weeks and receive the nursing care and, it is hoped, the aggressive rehabilitation designed to return them to the community.

4. A custodial institution for people who no longer belong in a hospital and yet cannot be cared for at home because of disabilities, handicaps, or social situations. This institution emphasizes nursing care and meets the daily needs of severely handicapped people. It would be desirable if it were on or near the hospital grounds, and certainly its medical care program should be under the supervision and direction of the general hospital.

5. An adequate outpatient department for those people who are sick but who can travel from their homes to the hospital. This activity should provide the kind of medical supervision and attention which will not only treat the immediate medical problems of these people but also will tend to keep them out of institutional facilities.

Summary

Chronic disease in its active, acute phase requires the high-quality, complex diagnostic and therapeutic facilities of the general hospital. Beyond this phase lies a varying period when lesser but continued medical, nursing, and related care is needed. A home care program, an outpatient department, a nursing home, and a custodial institution, preferably on the hospital's physical premises but certainly under its auspices, are required to meet these needs. Such broad responsibility should be assumed by the hospital because its medical and related resources are organized and available in a manner that can rarely be duplicated by lesser medical care facilities.

chronic illness the greatest challenge that nursing, with its skills, understanding, and compassion, has ever been called upon to face.

Readjusting

A serious difficulty accompanying long illness and disability is the impact of the illness upon the patient's relationships with his family and with society. Most families do not have either the financial or emotional resources to withstand the onslaught of chronic disease without help. We must recognize that chronic illness not only tends to pauperize our families but also has a destructive effect upon the family structure. Therefore, we must deal with the personal and familial emotional and social aberrations which accompany every serious long-term illness.

Here is a typical example of these difficulties. A 50-year-old man, the head of a family and the breadwinner, develops abdominal symptoms, goes to the hospital, is operated on, and is found to have a cancer of the bowel with some spread. This man not only has his life threatened by illness, but after his period of hospitalization, he is going to be handicapped and ill for the remainder of his life. Instead of being the leader and provider he will have to be cared for and provided for.

This is not only a personal catastrophe, but a catastrophe for the entire family. His wife has to assume responsibilities which he formerly bore. His children, for whom he had great hopes and aspirations, can no longer continue with their schooling but must help the family in its difficulties. One day he is a father, husband, leader, producer, giver; several weeks later the entire social structure built up over a long period of time has been shattered.

Anyone who has cared for the chronically sick has seen patients whose greatest lack of well-being, whose suffering and discomfort came, not from the physical pain and the illness which might ultimately destroy them, but from the disordered situation which the illness has produced within the family.

We physicians concerned with hospital and medical care cannot narrowly define our responsibilities as we might like to. We must define our responsibilities to fit the patient.

Since the social and emotional effects of long-term illness are vital to the well-being of the patient, the family, and the community, we must concern ourselves with this kind of problem just as effectively and aggressively as we do with organic medical problems. The social worker with her special training and skills can effectively join with the physician to meet this important patient need. The general hospital will have to broaden its philosophy and resources to deal with this aspect of illness.

Special skills are needed in medicine, physical medicine, psychiatry, social work, nursing, vocational rehabilitation, speech therapy, and many other areas to enable the patient to make the maximum use of his remaining physical, mental, and emotional resources. This concept of patient care has recently gained recognition. Every general hospital, nursing home, and home care program should undertake the rehabilitation activities appropriate to its patient population.

Among the many other activities that we must undertake in caring for patients with chronic illness is occupational therapy. This can be a very important tool if it is utilized in an intelligent manner and is integrated with other medical care. It is sad to realize that the first extended period of leisure which some people have ever had has been enforced by serious illness. In our own experience we have found that skilled occupational therapists, warm, interested, and willing to find out what kind of person the patient is, what his interests are, and the directions in which his talents or desires lie, can help patients to find the well-springs of creativity which exist within so many people unknown to themselves or others. This discovery adds a new dimension to the sick person's life and makes him feel productive and worthwhile.

Other services, such as recreation, vocational training, counseling, and job placement, are also required.

Community Program

In all communities we face the need to modify, change, and add to existing resources, facilities, and services so that we can adequately serve the chronically sick. I recommend that

others are to understand his results, it also calls for an "ungrooving" of the specialist.

The Health-Related Fields

In the broadest sense, anything that enables an individual to maintain a satisfactory level of health may be considered health related. It is advisable at this point, however, to limit discussion to economic and social services that are quite obviously health related and that can be readily integrated with those personal and family health maintenance programs that form the true basis for the public health of the community.

Counseling and group work, employment after retirement, housing, and community organization are vitally important health-related services, but two important factors underlie all of them in our approach to better public health.

One of these is education of the public, especially through adult education, without which forward movement in each specific service would probably have been much slower than it has been.

The other is our country's means of providing income through employment and through its social security system. Private and government enterprise seeks to enable the individual by means of his own resources to assume the responsibility of his own health and his family's, even through the lean years of retirement.

Social Security Programs

Conditions of employment, including the wage level of the general population, play a distinct role in maintaining the health of workers and their families. These conditions are tempered by the degree to which workers appreciate their health needs since for many health is a strictly personal matter. This is another way of saying that money without understanding of how it can best be used is not enough.

It is increasingly apparent that management and labor are sensitive to the impact of working conditions upon the health of workers, over and beyond the safety measures that are ad-

mittedly health related. The growing concern about industrial health and about plans for services to reduce the costly inroads made by chronic illness on productivity indicates the direct relationship between jobs and economic and individual health.

This concern is most practically expressed in the partnership of government, business, and industry in the Nation's social security programs. These undeniably provide the most effective bulwark we have in maintaining the health of workers and retirees. The achievements by 1957 of the past generation in social security can be looked upon with justifiable satisfaction, even pride, by everyone. The interdependence of privately and publicly supported programs of economic and social security and public health programs does not require elaboration, although voluntary agencies may overlook at times the fact that their selectivity is possible only because the public services are in operation.

It has been said that the public assistance program is one of the best means of finding cases of acute or chronic illness. This is probably true of both the disability and the old-age and survivors' insurance phases of social security, although their lack of direct social service may make casefinding a somewhat minor component of the program.

The beneficiaries of these services have as a rule low or marginal incomes. A large majority of them are middle-aged or older people, and they are ready victims of illness. Until there is a closer working relationship between security programs and community health services (both voluntary and public), we shall not realize with sufficient understanding that for children and older adults inadequate living and health facilities are sources of the increasing incidence of chronic ailments. The income of the older adults usually fails to provide proper housing, decent environment, proper nutrition, or adequate medical care when and as needed. It may be truthfully said, however, that more is done in providing medical treatment than in underwriting the other factors that might help to prevent the present, extensive need for treatment.

The results of huge expenditures of scientific effort and funds for the development of the

Health Related Services

OLLIE A. RANDALL

THE FACT that health-related services is a topic at this symposium is tangible evidence that among those concerned with health there is recognition of the fundamental kinship of health services and those services more commonly regarded as social or economic in purpose. This is a long step forward toward the time when the health and welfare of a human being and of the public of which he is an integral part will be literally indivisible.

This is not to deny that there are sicknesses of the body and mind that arise from physical causes accidental to or inherent in the environment. To trace and correct these causes is the traditional concern of public health personnel. However, sicknesses arising from social situations created by an uncongenial environment are more prevalent than ever before and have little direct relationship to the traditional focus of public health service. If we endorse the premise that the community's level of health can only be accurately measured by rating the level of health of each of its members, then the correction of socially induced illnesses becomes a logical matter for the attention of those developing or administering public health programs.

If this premise is sound, the real questions are how and through whom these economically and socially induced illnesses can be discovered and corrected. Since the basic unit of our work is the human being, the general current thinking (but not current practice) sug-

gests that treatment of the whole man is essential to the attainment of desired results or their nearest approximation, according to the means at our command.

It is perhaps trite to comment that the complexity of organized society, and the rapidity by which that complexity is constantly being compounded, is often at the root of the individual's difficulties. It is even more trite to point out that well-directed and well-balanced teamwork is required if the interrelationship of these services and interests is to be demonstrated.

The team which comes into existence through our accepting the concept of a close relationship between social and health services consists of health and socioeconomically trained personnel, and, incidentally, the individual and his family. The task of the professional members of that team is to bring together as best they can the skills of the participants whose specialties have been splintered from the originally comprehensive and central core of treatment.

With the growing number of specialties in health and health-related fields, it is no longer possible for one person to be equally well versed in all of them. But it is possible to be aware of the potential that resides in their combination for preventive and better patient care and for public health. Without merging skills, the potential is obscured or lost.

In our day, it is the chronic or long-term illness or invalidism induced by such illness, with its health, social, and economic ramifications, that professional medical personnel are called upon to diagnose, understand, and treat. This may call for further specialization, but, if

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strains created by this complexity, some glimmer of understanding of these attitudes becomes an essential component of health and social security programs.

If as one delegate to a governmental session forcefully commented, "Try to get a doctor to go to the home of an old chronic! It's pure nonsense to talk about it. Doctors just don't and won't go!" If this is true, whatever the reasons, doctors must come to depend on teamwork with social workers and public health nurses. For their success in working with people derives from a clear and sometimes intimate acquaintance with physical, psychological, and economic conditions in the home.

Today the public health nurse is the professional person most frequently visiting the home of chronically ill people. Generally, she is the one who is most welcome because of her easily understood and readily accepted service. If ways can be found to use her special skills at the outset of counseling, casework, or group work, we are more certain to find, as we have in the agency with which I am connected, that as health problems are minimized or resolved social situations have a way of being resolved or of resolving themselves more quickly.

Much has been said and written on the preventive aspects of group work in clubs and day centers with older people. Perhaps some of these claims can be substantiated. Experience, however, cogently indicates that professionally directed clubs and centers are seriously handicapped and limited unless they have direct ties with counseling, casework, or health services. The handicap stems usually from the need for help on physical and mental health problems; the staff is often unable to advise these people or to refer them correctly.

All this seems to point to the necessity for a greater emphasis on the physical and mental health aspects of social work, particularly in the family and group work agencies, and a greater emphasis on the social aspects of health work for health personnel.

As some of us watch service programs for older people, of whom many are handicapped by chronic illness or invalidism or are likely candidates for similar handicaps, the need for a working liaison between the branches of "comprehensive care" is distinctly highlighted.

With the current shortages of trained personnel in all fields of service, probably the most we can expect or ask for is that the desirability of such teamwork be recognized through the appointment of consultants from the field of health in social agencies and from social services in health agencies.

Postretirement Employment

If we consider postretirement employment desirable, we must find some way of making employers and employees aware of the working conditions that are conducive to maintaining health at a level necessary to meet the requirements of the daily job. We must also learn more about an individual's health potential so that we may look for positive possibilities of employment. If it is a fact that we are reaching our later years in better health than our fathers or their fathers did, let us hope that health personnel can help us capitalize on this fact through the employment of older and retired workers.

There is at present a vague, but probably not baseless, notion that with better financial underpinning of retirement, older persons are less apprehensive about it and more willing to accept it, especially if retirement has been planned for. But we have a long way to go before retirement is fully welcomed and an equally long way to go before it is sufficiently underwritten to overcome the need many older people have of working mainly for the money they can earn, regardless of psychological or social motivation.

Society must also cope with the "right to work" at any age, for the worker's sake and perhaps for the sake of society as a whole. This topic is so controversial I shall only comment that any employment program for the elderly must be closely allied with a constantly watchful health program of prevention, treatment, and restoration. The last of these has not so far been as readily available to older people, either workers or nonworkers, as actual circumstances warrant.

Whereas older people are exceptionally vulnerable to the consequences of acute disease, we are finding they are also capable of an encouraging degree of restoration if given the benefit

Salk vaccine were dramatic; it would be wonderful if there could be an equally dramatic demonstration of what similar amounts of money and scientific effort might do to prevent or minimize the high incidence of malnutrition. Thousands of malnourished children and older adults are susceptible to acute or chronic disease, but exist on assistance grants and insurance benefits that, with all the will and skill to spend wisely, are just not enough to encompass their health needs.

With the new national public assistance grants that permit some States to take advantage of funds to provide more adequate medical care for recipients of public assistance, there will be spotty improvement. But with low levels of basic assistance in many areas, little more will be accomplished than *ex post facto* treatment. Strong bodies that resist more readily the inroads of acute or chronic illness will not be built. The program, moreover, will not help the beneficiary of social insurance whose funds are sufficient to make him ineligible for even consultation regarding his health needs, but are insufficient to enable him to pay for proper care. What is vital in all this is the growing opportunity and necessity for teamwork among the arms of public services at every level of government and among official agencies and voluntary social and health services at the local level.

Money, or the lack of it, is only one factor in the health situation. Hence the Public Health Service's development of the Chronic Disease Program offers a service of tremendous value that public and voluntary social agencies should promptly seize upon. The present possibility of educating the public about the known causes of illness, the effects of untreated illness, and the wisdom of taking advantage of the vastly improved knowledge of illness is without past parallel in most communities. It is a matter of record that lectures and discussions that attract the largest number of adult listeners and interested participants pertain to health and the prevention or treatment of illness. Matters of income maintenance run a close second. The necessity of learning to protect health and income is engaging more of the time, efforts, and funds of private persons and organized groups than ever before.

Individuals and social agencies, however, need a better understanding of health and illness and the effect of the latter on their work. Health agencies have a similar need to understand the meaning of individual attitudes and family culture and their impact upon physical and mental health.

Informal and formal groups offer an unusual opportunity for the dissemination of health information; the phenomenal growth of adult education programs should be taken advantage of without delay.

Counseling, Casework, and Group Work

In recent years the direct personal relationship between an individual and the social worker whose primary concern is the well-being of that individual has also gone through some changes. It is now divided into two phases: counseling and casework. This development seems to imply that counseling is either the threshold for casework or a rather diluted form of the intensive process that characterizes casework. Whether or not this is an accurate analysis, we find more and more people, particularly the middle-aged and older people, seeking "counseling" on health matters in all kinds of service agencies. Much more must be done in training and in the development of mutual understanding between health and social services if such counseling is to be sound.

Group work, in social service, helps people adjust to each other by coming to grips with their needs as they are modified or aggravated by the needs of others and by obtaining individual satisfaction through group action. With older people, this phase of social work is used extensively, with varying success, in "golden age" clubs and in day centers.

In counseling, casework, and group work it is essential to know the person as he is in a variety of settings and relationships (as a family member, worker, and citizen at large), and as he thinks he is. There can be a real difference between the two.

Of all the settings, the most important is the home; for here attitudes about health as about other matters originate. As living becomes more and more complex, as the firmness of family ties yields to some of the stresses and

whose major objective is better service to the individual. Ultimately these measures should improve the quality of care in institutions as well as in homes, when the home-care programs are expanded.

As one observes the changing purpose of hospitals and homes for the aged and the changes in the actual use of them (nursing homes, for example, are now established as a part of the community's medical care facilities), one has

an almost overwhelming sense of the immensity of the task of community education and organization that lies ahead before we find the chronically ill patient in the right place at the right time.

Sincerely interested leadership promises a brighter future, especially if all the "relatives" of the health field join with it in order to work toward an earlier approximation of the goal of comprehensive health care.

Medical Research Expenditures in 1970

Expenditures for medical research in this country can and should be tripled to reach a billion dollars a year by 1970, a group of special consultants to the Secretary of Health, Education, and Welfare said in a recent report.

The special consultants, 10 prominent medical educators and industry research executives, were appointed in 1957 by the Secretary to advise him on long-term needs in medical research and medical education. Dr. Stanhope Bayne-Jones, formerly dean of Yale University School of Medicine, was chairman.

The consultants warn, however, that such an expansion of medical research will require a major increase in the number of physicians and other scientists—from 20,000 now to 45,000 in 1970. To make possible this increase in research staff and at the same time to provide a sufficient number of physicians to give adequate care to the expanding population, additional educational facilities will be needed, they indicate.

According to present estimates, there will be only 19,000 additional physicians and scientists for medical research during the next 12 years, 6,000 short of the estimated 25,000 additional workers needed, the report states.

The consultants believe that "it would not be in the public interest for the number of physicians in the Nation to fall below the ratio of 132 for 100,000 persons." This ratio has remained fairly constant over the past 30 years.

To maintain this ratio, they assert, would require construction of from 14 to 20 new medical schools at a cost of between \$500 million and \$1 billion. This expenditure for medical school construction would be on a much larger scale than has heretofore been contemplated.

As the consultants point out, however, even if these large funds are made available immediately, the ratio of physicians to population will fall before 1970 because of the usual lapse of 10 years from the time a school is planned until the first class is graduated.

If the Federal Government continues to provide about half of all funds for medical research, Federal expenditures would increase from \$186 million in 1957 to approximately \$500 million by 1970, the consultants estimate. Industry's share in 1970 would be more than \$300 million, and contributions of private philanthropy would amount to \$100 million.

of rehabilitation. Hence an unbiased partnership among management, labor, employment counselors, and health agencies assumes high priority for employment practices in the period currently designated as "retirement years."

Housing

Where and how people live unquestionably helps to determine the status of health they can maintain. The public health services have long been engaged in evaluating the sanitation and environmental factors which adversely affect health. Their concern not only for those facilities designed to house special health services but for housing accommodations in which people live assumes greater validity as more people, especially the chronically ill, continue to remain at home when sick.

If we take only the fact that about 95 out of 100 older people live in their own homes, either alone or in families, and relate that to the fact that the proportion of persons limited by chronic ailments is higher in the upper age brackets, it is not difficult to estimate the importance of any program of home health care and the attention that must be paid to the appropriateness of the home itself.

Whereas good family relationships are fundamental to propriety, the actual physical accommodations and their proximity to available services should be given equal consideration, whether the housing is under private, quasi-public, or public auspices. Principles of architectural design such as public health agencies propose for health facilities to reduce hazards and to be useful even for those with orthopedic handicaps may be applicable to private housing.

Certainly, in any large multiple dwelling as well as in individual homes accommodations that enable the chronically ill to remain at home have economic and social values that appear to merit serious thought.

The advice and help of health personnel are, or should be, an integral factor in such planning. As we look ahead to more extensive public housing programs for the elderly this becomes self-evident. But most conferences bog down on questions relating to the services and kinds of living quarters that are desirable and functional for the elderly under changing

health circumstances. It is not a question of what, or how much of what, should be included in proposed or future housing plans for adequately accommodating the sick or infirm; we are confronted with the immediate issue of what should be done for those who have lived in housing developments long enough to be now among the aged. The housing and the tenants have aged together.

Community Organization

As we consider the community in which the chronically ill live and realize how great the gap is between facilities, services, and our knowledge about who the chronically ill are and what their demands are, it is easy to become discouraged.

Yet there is a trend (and perhaps the needs of the chronically ill are partially responsible) which is quite encouraging. This is the movement for the gradual merger of health and welfare planning agencies. Citizens are showing greater interest as more and more families are faced with problems for the solution of which neither services nor facilities exist, to say nothing of funds.

In these community movements there is a new realization that no single group in the community can be exempt from participation in both planning and action. Management and labor and professional personnel from all governmental and voluntary agencies and disciplines, including the church, and interested laymen will all be involved since all are directly affected. There is still the troubling tendency to specialize in disease entities or in groups defined by age and other distinctive characteristics, but even in specialized agencies (for example, the heart associations and commissions for the aging and aged) there is an intense awareness of the need for being a part of the local, State, and national communitywide approaches to the prevention and control of chronic illness.

Another encouraging sign is the trend to bring together, at least as affiliates, the various institutional programs of diagnosis, treatment, and restoration that serve the chronically ill. It will be still more encouraging when social service agencies are more definitely coordinated with and are promoting this type of affiliation

A refined method of estimating numbers of future births, based on age-parity specific rates, is used to obtain two series of birth projections for the period 1956-65.

Short Range Birth Projections

JOSEPH SCHACHTER, B.B.A., DEWARD E. WAGGONER, Ph.D., and PASCAL K. WHELPTON, B.A.

ESTIMATES of the number of births that will occur during the next 10 years are of considerable importance for effective program planning in areas of public health, social welfare, economic activity, and community facilities. In response to the need for such data, various methods have been developed for estimating the number of future births on the basis of alternative assumptions as to fertility trends. These estimates are generally called projections. While they do not purport to predict the future, projections are usually designed to provide alternative birth series representing the range of reasonable possibility. A large element of judgment is, of course, involved, but a knowledge of fertility trends and an understanding of the current demographic situation are basic factors in the quality of the results.

Of the various methods for making birth projections, the one most widely accepted uses age-specific birth rates to measure fertility (1, 2). This rate is defined as the number of births to mothers of specified age per 1,000 women in the corresponding age group. Time

series of these fertility rates are extrapolated on the basis of alternative assumptions as to future trends. A parallel series of estimates of the projected female population in the reproductive ages is obtained by "aging" the present population the required number of years and adjusting for anticipated mortality and net immigration. The projected rates are then applied to the projected numbers of women to derive estimated numbers of births.

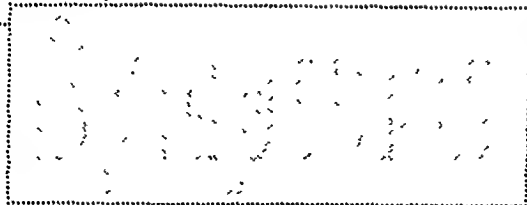
A logical refinement is introduced into the foregoing procedure by the substitution of the age-parity specific birth rate as the fertility measure. This rate is a birth probability, having as its denominator the number of women of specified age at the beginning of the year who are subject during the year to a birth of specified order. The numerator represents the number of these women who experience a birth of this order during the observation year. Thus the age-parity rate identifies the female population at risk of pregnancy not only in terms of the women's ages but also the order of birth to which they are subject. The age-specific rate, of course, does not take explicit account of this latter variable.

In the proposed method of projection the birth probabilities are extrapolated and applied to successive cohorts of women classified by age and parity. The end product is a series of birth frequencies classified by single years of age of mother and by birth order. We have applied this procedure experimentally to obtain two series of birth projections for the period 1956-65, based on available fertility data

Mr. Schachter and Dr. Waggoner are assistant chief and chief, respectively, of the Natality Analysis Section, National Office of Vital Statistics, Public Health Service. Mr. Whelpton is director, Scripps Foundation for Research in Population Problems, Miami University, Oxford, Ohio. The paper is based on one presented at the meeting of the Population Association of America, Chicago, May 4, 1958.

Signs

and



A 2-day orientation course in atmospheric pollution presented by the University of North Carolina at Chapel Hill in cooperation with the North Carolina State Board of Health has kicked off the State's first clean air inventory. A 6-month statewide study will be carried out under a Public Health Service grant.

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New York State Health Commissioner Hilleboe last July asked the State Attorney General to bring legal proceedings against more than 700 hotels and camps that had not obtained permits to operate. Under the law, a sanitary permit is required for every "temporary residence" in the State.

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Almost 3,000 physically handicapped workers are employed by the Department of Health, Education, and Welfare, in a total payroll of \$3,000.

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Dr. Leonard Greenberg, New York City's commissioner of air pollution control, urges city motorists to maintain vehicles so as to combat visible exhaust smokes. A leaflet on the subject, prepared by his office, can be obtained from the Department of Air Pollution Control, 15 Park Row, New York 38, N. Y.

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Two amendments to the New York public health law require that firms and institutions apply to the State health department for permits to deal in, or dispense, narcotics after July 1, 1958. Each licensee is required to pay a \$25 fee, and to register biennially starting April 1, 1960. Hospitals, laboratories, and dispensaries must pay \$10 fees and are also subject to biennial registration.

Highway accidents are gaining recognition as the principal cause of death and disability among migratory agricultural workers.

The Toledo, Ohio, Diocesan Council of Catholic Women has prepared and distributed a 2-page pamphlet in English and Spanish on safety suggestions, based on the new ICC regulations.

Migrant workers may operate their out-of-state registered motor vehicles in Maryland for extendable periods of 90 days provided they first obtain a permit from an office of the Maryland Department of Employment Security and conform with other requirements regulating the use of vehicles transporting seasonal farm labor, the distance between crop and destination (not to exceed 25 miles), and the insurance coverage of vehicles (minimum of \$10,000-\$20,000 PI and \$5,000 PD).

Pennsylvania's transportation regulations, similar to the ICC's, require owners of out-of-state vehicles used to transport seasonal crop workers to obtain a special permit. Vehicles must also be officially inspected.

« »

An all-out program of home inspection by fire departments would cut fire deaths as much as 50 percent, according to Percy Bugbee, general manager of the National Fire Protection Association. There were 6,405 accidental deaths by fire in the United States during 1956.

« »

In 1900, according to the Health Information Foundation, nonwhite infants could expect to live 33 years. By 1953, their life expectancy increased to 63.2 years, still 7 years less than the average for whites.

More than 25,000 copies of the leaflet, Food Facts vs. Food Fallacies, have been distributed since it was prepared in April 1957 for the Department of Health, Education, and Welfare to warn against quackery in nutrition.

« »

Three demonstration projects in Indianapolis, Kansas City, and Cincinnati will show what can be done in the above municipalities for those with "personal adjustment problems which prevent them from maintaining employment." The Office of Vocational Rehabilitation is paying the bulk of expenses.

A project at the Indianapolis Goodwill Industries gives preference to physically disabled persons with emotional problems. Goodwill and the Indiana Mental Health Association will share \$50,000 cost for the first year of a 3-year program.

« »

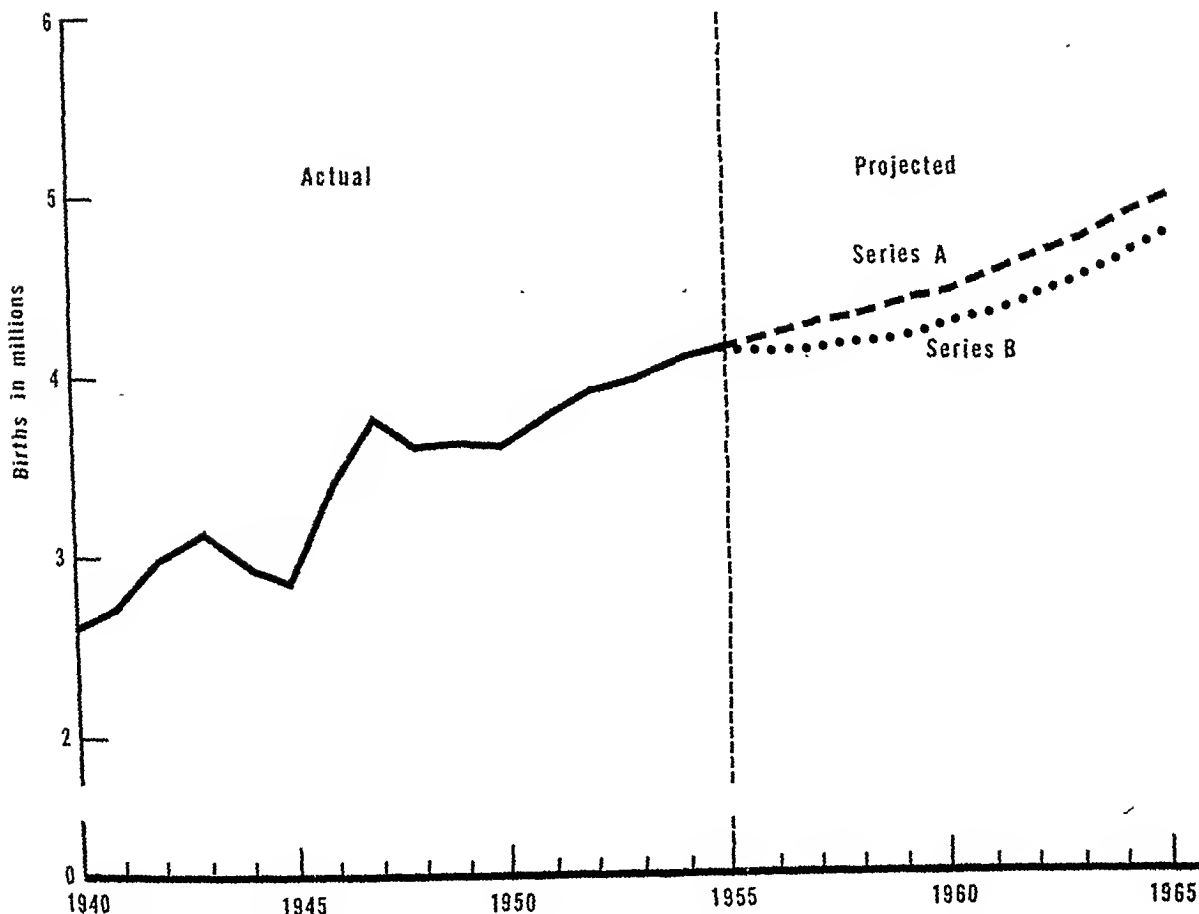
A series of publications on air pollution, poisoning, and library resources have been issued by the division of occupational health, Texas State Department of Health, in Austin. Their titles are:

Ordinances and Legislation Related to Air Pollution, OH-20, December 1957; Current Trends and Approach to Air Pollution Problems in Texas, OH-20A, January 1958; The Problems and Effects of Air Pollution, OH-20B, January 1958; Communities and Counties in Texas Where Accidents Involving Use and Transportation of Atomic Materials Might Occur, OH-25, April 1958.

Poison Control Centers: Recommended First Aid Measures, OH-24B, June 1958; Poison Control Centers Located in Texas, OH-24A, June 1958; Economic Poisons Currently Recommended by Texas Agricultural Extension Service, and Organisms Against Which Recommended, OH-6-1 (superseding OH-6), March 1958.

Important Economic Poisons, OH-5-1 (superseding OH-5), March 1958; Poison Control Centers: Toxicology Information, OH-24, April 1958; and Occupational Health Library, OH-19-1 (superseding OH-19), April 1958.

Figure 2. Actual and projected numbers of births, United States, 1940-65.



3. Have a slope of zero in 1960.

The following general equation was used to fit the curves to each of the series of observed data:

$$v_x = ax^2 + bx + c$$

where v_x denotes the computed rate corresponding to the abscissa x (year-1950). Here a , b , and c are constants to be determined for each series in accordance with the conditions previously stated, which lead to the expressions:

$$a = \frac{\sum_{x=0}^5 M_x \left(Y_x - \frac{Y_4 + Y_5}{2} \right)}{\sum_{x=0}^5 M_x^2}$$

$$b = -20a$$

$$c = 69.75a + \frac{Y_4 + Y_5}{2}$$

where Y_x is the observed rate in the year 1950 + x , and $M_x = x^2 - 2x + 69.75$.

Separate equations conforming to the conditions set forth above were computed for each of the series of age-parity rates and mathematically extrapolated to 1960. As a visual check on the goodness of fit, freehand curves were also plotted and extrapolated, and the results were compared with those obtained mathematically. In a few cases the freehand curve appeared to provide a more reasonable basis for projection purposes, and these were so used. But in general, the mathematical results were found to be suitable. Age-parity rates were then derived algebraically for each year 1956 to 1960, and the rates for the latter year were used also for the 1961-65 period.

Cohort Survival

The next step in the projections was the application of the projected rates successively each year to the numbers of women of corres-

through 1955 and on alternative assumptions as to future fertility. All birth data are adjusted for under-registration.

Projection Series A

Age-parity specific birth rates for the period 1950-55 were furnished by Whelpton, together with figures showing the estimated distribution of the female population as of January 1, 1955, by single year of age and by parity. These data and a detailed discussion of their nature will be presented in his forthcoming fertility monograph, which revises and expands an earlier publication on the subject (3). The birth rates were formed into time series for each age-parity group and examined to determine their trends in recent years. There were about 240 such series, some of which are illustrated in figure 1. In general, the trend showed an upward movement during the 6-year period but at a declining rate.

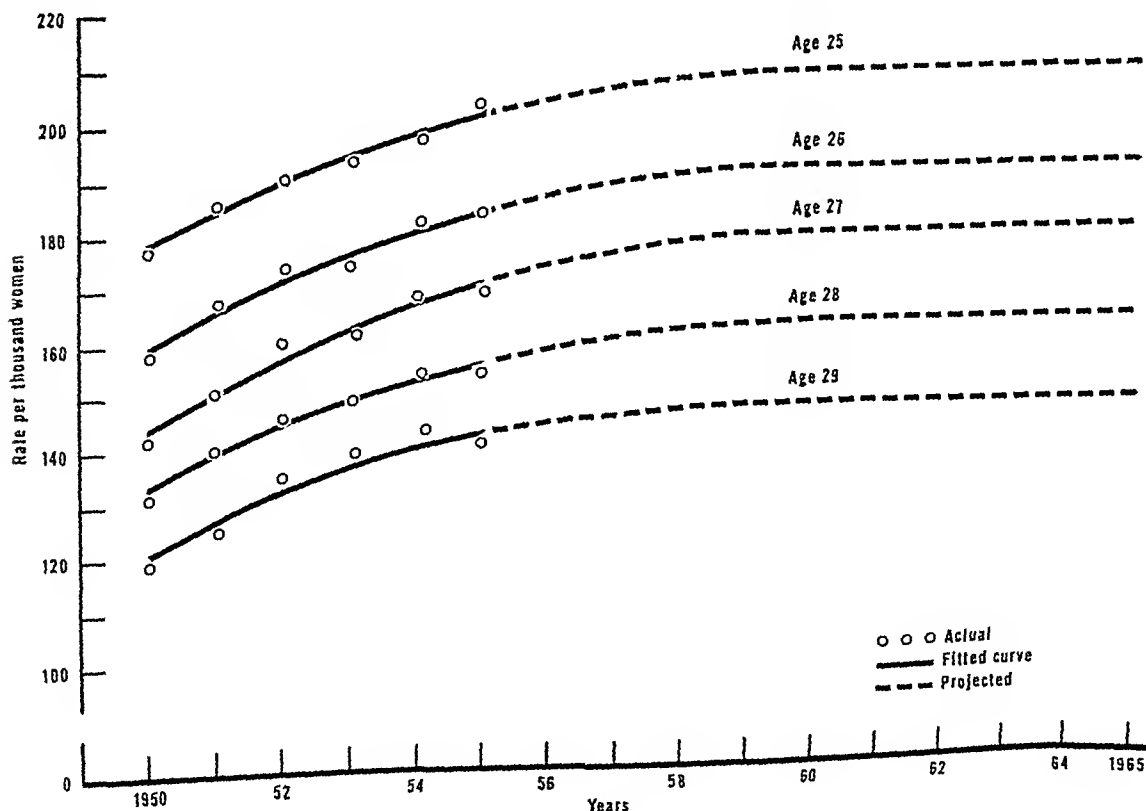
Fertility Assumptions

For extrapolation purposes, various assumptions could, of course, be made as to the future direction of fertility trends. A reasonable possibility, however, was that these curves would level off by 1960 and remain at that level until 1965. This hypothesis formed the basis for series A, the first of two illustrative projections. A second series, series B, was also prepared, based on the assumption that the 1955 age-parity rates would remain the same in each of the years 1956-65 (fig. 2).

To apply systematically the fertility assumptions underlying series A, a second-degree equation was fitted to the 1950-55 age-parity rates, the curve of which would satisfy the following conditions:

1. Form a least-squares fit to the data for 1950-55.
2. Pass through the arithmetic mean of the 1954 and 1955 rates at the ordinate midway between those for the 2 years.

Figure 1. Age-parity rates for third births to women 25-29 years of age, United States, 1950-65.



grants to the total number of births during the projection period is small. For 1960, births to immigrants represent only 1.7 percent of the estimated total, and for 1965 less than 3 percent.

Adjustment of First-Birth Estimates

An analysis of first-birth and marriage figures during the postwar period shows a high linear correlation (.96) between the two variables, with a lag of 1 year. It is believed that, if this relationship is utilized, some further refinement is introduced into the projections of first births for 1956-58. Since annual marriage data are presently available only through 1957, it is not possible to carry out the adjustment of first-birth projections beyond 1958.

The following regression equation for the relationship between marriages (X) in year M and first births (Y) in year $M + 1$ was derived for the period 1948-55:

$$Y = 668,000 + 0.8128X$$

The adjustment of first births by single years of age of mother in the original projections to the estimate of first births based on marriages was made on a pro rata basis. The revised figures differed only slightly from those obtained by the use of parity rates; the amount of ad-

Table 2. Cumulative birth rates¹ for cohorts of women surviving to 1955 and 1965, continental United States

| Age (years) | 1955 rate | 1965 | | | |
|-------------|-----------|---------------------|----------------------------|---------------------|----------------------------|
| | | Series A projection | | Series B projection | |
| | | Rate | Percent increase over 1955 | Rate | Percent increase over 1955 |
| 15-19 | 96 | 95 | -1.0 | 100 | 4.2 |
| 20-24 | 865 | 967 | 11.8 | 923 | 6.7 |
| 25-29 | 1,718 | 2,163 | 25.9 | 2,062 | 20.0 |
| 30-34 | 2,194 | 2,889 | 31.7 | 2,821 | 28.6 |
| 35-39 | 2,318 | 3,054 | 31.8 | 3,006 | 29.7 |
| 40-44 | 2,263 | 2,889 | 27.7 | 2,866 | 26.6 |
| 45-47 | 2,233 | 2,646 | 18.5 | 2,638 | 18.1 |

¹ Number births per 1,000 women.

NOTE: Data for 1955 based on actual figures; data for 1965 derived from birth projections.

Table 3. Estimated percent childless among cohorts of women surviving to 1955, 1960, and 1965¹

| Age (years) | 1955 | Series A projection | | Series B projection | |
|-------------|------|---------------------|------|---------------------|------|
| | | 1960 | 1965 | 1960 | 1965 |
| 15-19 | 92.2 | 91.9 | 92.3 | 92.0 | 92.0 |
| 20-24 | 50.1 | 46.2 | 46.2 | 48.2 | 48.2 |
| 25-29 | 24.2 | 19.4 | 17.5 | 20.0 | 19.2 |
| 30-34 | 15.7 | 13.7 | 11.1 | 13.8 | 11.4 |
| 35-39 | 17.1 | 11.6 | 10.1 | 11.8 | 10.4 |
| 40-44 | 20.7 | 15.9 | 10.7 | 15.9 | 10.9 |
| 45-47 | 22.5 | 20.0 | 13.7 | 20.0 | 13.7 |

¹ 1955, actual; 1960 and 1965, projected.

justment averaged about 1 percent per year for the 3 years.

Results

On the basis of series A assumptions, total live births increase from 4,104,000 in 1955 to 4,446,000 in 1960, and then climb more rapidly to reach a figure of 4,994,000 in 1965 (table 1). First births, after an initial rise from 1,138,000 in 1955 to 1,164,000 in 1957, drop off slightly in 1958 and 1959. Thereafter, however, the number climbs steadily to 1,345,000 in 1965.

Second births decline for the first 6 years of the projection period (from 1,104,000 in 1955 to 1,075,000 in 1961), then turn upward during the next 4 years, and by 1965 number 1,150,000. All higher-order births increase consistently during the 10-year span. The following figures show the relative increase of birth-order frequencies from 1955 to 1965 implied by projection series A:

| Live birth order | Percent increase |
|------------------|------------------|
| Total | 21.7 |
| First | 18.2 |
| Second | 4.2 |
| Third | 9.4 |
| Fourth | 30.7 |
| Fifth | 55.4 |
| Sixth | 74.8 |
| Seventh | 87.5 |
| Eighth and over | 81.8 |

An interesting aspect of this birth projection technique is that it permits the derivation of cumulative fertility rates and estimates of the

Table 1. Series A birth projection results for the United States, 1956-65¹

| Year | Total | Live birth order | | | | | | | |
|---|--------|------------------|--------|------|------|-----|-----|-----|------------|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 and over |
| Number in thousands | | | | | | | | | |
| 1955 ² | 4, 104 | 1, 138 | 1, 104 | 800 | 462 | 249 | 139 | 80 | 132 |
| 1956 | 4, 204 | 1, 147 | 1, 100 | 818 | 491 | 270 | 151 | 87 | 139 |
| 1957 | 4, 287 | 1, 164 | 1, 094 | 828 | 511 | 288 | 163 | 94 | 146 |
| 1958 | 4, 341 | 1, 151 | 1, 094 | 835 | 529 | 304 | 174 | 101 | 154 |
| 1959 | 4, 385 | 1, 135 | 1, 090 | 840 | 544 | 319 | 185 | 108 | 164 |
| 1960 | 4, 446 | 1, 148 | 1, 079 | 844 | 556 | 332 | 196 | 116 | 175 |
| 1961 | 4, 538 | 1, 189 | 1, 075 | 846 | 567 | 345 | 206 | 123 | 187 |
| 1962 | 4, 630 | 1, 220 | 1, 083 | 848 | 577 | 356 | 216 | 130 | 200 |
| 1963 | 4, 735 | 1, 256 | 1, 098 | 853 | 586 | 367 | 225 | 137 | 213 |
| 1964 | 4, 856 | 1, 298 | 1, 121 | 862 | 594 | 377 | 234 | 144 | 226 |
| 1965 | 4, 991 | 1, 345 | 1, 150 | 875 | 604 | 387 | 243 | 150 | 240 |
| Rate per 1,000 women 15-44 years old ³ | | | | | | | | | |
| 1955 ² | 116.2 | 32.2 | 31.3 | 22.6 | 13.1 | 7.1 | 3.9 | 2.3 | 3.7 |
| 1956 | 118.6 | 32.4 | 31.1 | 22.1 | 13.9 | 7.6 | 4.3 | 2.5 | 3.9 |
| 1957 | 120.2 | 32.6 | 30.7 | 23.2 | 14.3 | 8.1 | 4.6 | 2.6 | 4.1 |
| 1958 | 120.5 | 31.9 | 30.3 | 23.2 | 14.7 | 8.4 | 4.8 | 2.8 | 4.3 |
| 1959 | 120.7 | 31.2 | 30.0 | 23.1 | 15.0 | 8.8 | 5.1 | 3.0 | 4.5 |
| 1960 | 121.6 | 31.4 | 29.5 | 23.1 | 15.2 | 9.1 | 5.4 | 3.2 | 4.8 |
| 1961 | 123.2 | 32.3 | 29.2 | 23.0 | 15.4 | 9.4 | 5.6 | 3.3 | 5.1 |
| 1962 | 123.6 | 32.6 | 28.9 | 22.6 | 15.4 | 9.5 | 5.8 | 3.5 | 5.3 |
| 1963 | 124.5 | 33.0 | 28.9 | 22.4 | 15.4 | 9.7 | 5.9 | 3.6 | 5.6 |
| 1964 | 125.8 | 33.6 | 29.0 | 22.3 | 15.4 | 9.8 | 6.1 | 3.7 | 5.9 |
| 1965 | 127.6 | 34.4 | 29.4 | 22.4 | 15.4 | 9.9 | 6.2 | 3.8 | 6.1 |

¹ Based on assumption that 1950-55 trends in age-parity specific rates will level off by 1960.² Actual.³ Rates based on Whelpton's population estimates, which differ slightly from those prepared by the Bureau of the Census and used in National Office of Vital Statistics publications.

ponding parity and age. The method used was that of cohort survival. This refers to the shifting of a population at a given date forward in time, making allowances in each age cohort for attrition due to mortality and for adjustments in its parity composition. As each cohort advances from one year to the next, its parity distribution changes to reflect its fertility experience in the previous year. The process involves an iterative series of successively linked computations.

Mortality and Migration

Mortality projections were needed to compute the proportion of each population cohort surviving from one year to the next during the 1956-65 period. The necessary survival factors were furnished by Thomas N. E. Greville, assistant chief actuary, Social Security Admin-

istration. They reflect assumptions of "medium" mortality during the 10-year period, that is, a moderate continuation of the presently declining mortality trends.

Account was taken separately of the number of births to the net immigrant population during the 1956-65 period. Estimates were obtained from the Bureau of the Census of female immigrant population projections by age for the 1957-60 and 1961-65 periods. From these data estimates of annual net immigration were derived. The cohort survival method was used to obtain the age distribution of each year's complement of immigrant females in each of the remaining years of the projection period. To the cumulative totals of immigrant females in each year 1956-65 were then applied the age-specific fertility rates derived for the general population. The contribution of immi-

Table 5. Series B birth projection results for the United States, 1956-65 ¹

| Year | Total | Live birth order | | | | | | | |
|---|--------|------------------|--------|------|------|-----|-----|-----|------------|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 and over |
| Number in thousands | | | | | | | | | |
| 1955 ² | 4, 101 | 1, 138 | 1, 104 | 800 | 462 | 219 | 139 | 80 | 132 |
| 1956..... | 4, 111 | 1, 117 | 1, 075 | 802 | 480 | 265 | 149 | 86 | 137 |
| 1957..... | 4, 121 | 1, 107 | 1, 052 | 801 | 496 | 271 | 159 | 92 | 144 |
| 1958..... | 4, 159 | 1, 108 | 1, 034 | 798 | 508 | 294 | 167 | 98 | 152 |
| 1959..... | 4, 201 | 1, 118 | 1, 024 | 794 | 517 | 306 | 177 | 104 | 161 |
| 1960..... | 4, 259 | 1, 137 | 1, 022 | 791 | 524 | 316 | 187 | 110 | 171 |
| 1961..... | 4, 330 | 1, 162 | 1, 028 | 791 | 530 | 325 | 195 | 117 | 182 |
| 1962..... | 4, 418 | 1, 196 | 1, 041 | 793 | 536 | 333 | 203 | 123 | 193 |
| 1963..... | 4, 518 | 1, 232 | 1, 061 | 800 | 542 | 340 | 210 | 129 | 205 |
| 1964..... | 4, 633 | 1, 274 | 1, 086 | 810 | 548 | 347 | 217 | 134 | 217 |
| 1965..... | 4, 762 | 1, 320 | 1, 116 | 824 | 556 | 354 | 223 | 139 | 229 |
| Rate per 1,000 women 15-44 years old ³ | | | | | | | | | |
| 1955 ² | 116.2 | 32.2 | 31.3 | 22.6 | 13.1 | 7.1 | 3.9 | 2.3 | 3.7 |
| 1956..... | 116.0 | 31.5 | 30.3 | 22.6 | 13.6 | 7.5 | 4.2 | 2.4 | 3.9 |
| 1957..... | 115.5 | 31.0 | 29.5 | 22.5 | 13.9 | 7.6 | 4.5 | 2.6 | 4.0 |
| 1958..... | 115.4 | 30.7 | 28.7 | 22.1 | 14.1 | 8.2 | 4.6 | 2.7 | 4.2 |
| 1959..... | 115.7 | 30.8 | 28.2 | 21.9 | 14.2 | 8.4 | 4.9 | 2.9 | 4.4 |
| 1960..... | 116.5 | 31.1 | 28.0 | 21.6 | 14.3 | 8.6 | 5.1 | 3.0 | 4.7 |
| 1961..... | 117.6 | 31.5 | 27.9 | 21.5 | 14.4 | 8.8 | 5.3 | 3.2 | 4.9 |
| 1962..... | 117.9 | 31.9 | 27.8 | 21.2 | 14.3 | 8.9 | 5.4 | 3.3 | 5.2 |
| 1963..... | 118.8 | 32.4 | 27.9 | 21.0 | 14.2 | 8.9 | 5.5 | 3.4 | 5.4 |
| 1964..... | 120.0 | 33.0 | 28.1 | 21.0 | 14.2 | 9.0 | 5.6 | 3.5 | 5.6 |
| 1965..... | 121.7 | 33.7 | 28.5 | 21.0 | 14.2 | 9.0 | 5.7 | 3.6 | 5.9 |

¹ Based on assumption that rates in 1956-65 will remain at 1955 level.

² Actual.

³ Rates based on Whelpton's population estimates, which differ slightly from those prepared by the Bureau of the Census and used in National Office of Vital Statistics publications.

percent of the official counts (table 4). With regard to birth order, the largest difference in 1956 was 2.7 percent, and the unweighted average difference for all birth orders, ignoring signs, 1.1 percent. The situation was similar with respect to age of mother. The largest difference was 2.8 percent, and the average difference, 1.5 percent. Virtually all the projected birth-order and age-of-mother totals for 1956 correctly reflected the direction of the true change from 1955. National data for 1957 by age of mother and birth order have not yet been tabulated. It is recognized, of course, that 1- or 2-year projections, however made, are much more apt to approximate the actual counts than projections 5 or 10 years ahead.

Projection Series B

A second projection, series B, was computed on the basis of the fertility assumption

that the age-parity birth probabilities during the period 1956-65 would be the same as in 1955. The mortality and migration assumptions are the same as in series A. The results are shown in tables 2, 3, and 5.

Series B births in 1956 and 1957 are below the numbers actually occurring in these years, and present indications are that they will fall short of 1958 experience. Should there be a downturn in fertility during the remaining years of the projection period, however, series B projections may provide a closer approximation of the birth situation during the first half of the 1960 decade than series A. In addition to its usefulness as a "low" series in bracketing possible future natality experience, series B serves two other purposes. It throws light on the question of the extent to which population and parity factors would result in a rise in the number of live births despite a

percentage of women at various ages who are childless. The cumulative fertility rate is the number of births per 1,000 survivors of each cohort. This measure is useful in relation to questions regarding the extent to which family size is increasing. For example, table 2 shows that in 1955, women aged 45-47 years had a cumulative fertility rate of 2,233 births per 1,000. The corresponding age group, according to the fertility assumptions of series A, will have a rate of 2,646 per 1,000 in 1965.

It is recognized, of course, that the foregoing figures represent the extension of current high levels of fertility. These high levels may be due to the fact that relatively more women are marrying, are doing so at a younger age, and are completing their families earlier in life. To the extent, therefore, that the current situation is attributable to these factors, the result may be primarily a change in the timing and spacing of children in relation to the mother's age and the duration of marriage rather than a large increase in the total number of children she will ultimately bear.

Table 3 shows the estimated percentages of

women who were childless at specified ages in 1955 and the corresponding percentages in 1965, based on series A projections. According to these figures, a much smaller proportion of the women surviving to the end of their child-bearing period will be childless in 1965 than is presently the case. In 1955, 23 percent of the women reached the end of their reproductive span without having a live birth. For women reaching age 45 years in 1965, the corresponding proportion would be 14 percent. The latter figure is only partially dependent upon the birth assumptions of series A. The women who will reach ages 45-47 years in 1965 had already experienced such high first-birth rates by 1955, at which time they were aged 35-37, that only 15 percent were still childless. Hence, regardless of their fertility experience during the next 10 years, they will have a substantially lower rate of childlessness in 1965 than the corresponding age group a decade earlier.

It is possible to compare series A projections for 1956 and 1957 with figures now available for these years. Insofar as the totals are concerned, the projected figures are within 0.3

Table 4. Comparison of projected birth figures¹ for 1956 with final tabulated data for that year

| Classification | Number of live births | | Percent difference ² |
|------------------------------|-----------------------|-----------|---------------------------------|
| | Projected | Actual | |
| Total..... | 4,204,000 | 4,218,000 | 0.31 |
| <i>Birth order</i> | | | |
| First..... | 1,147,000 | 1,166,000 | -1.6 |
| Second..... | 1,100,000 | 1,109,000 | -0.8 |
| Third..... | 818,000 | 821,000 | -0.4 |
| Fourth..... | 491,000 | 483,000 | +1.7 |
| Fifth..... | 270,000 | 263,000 | +2.7 |
| Sixth..... | 151,000 | 149,000 | +1.3 |
| Seventh..... | 87,000 | 87,000 | 0 |
| Eighth and over..... | 139,000 | 139,000 | 0 |
| <i>Age of mother (years)</i> | | | |
| 10-14..... | 7,000 | 7,000 | 0 |
| 15-19..... | 515,000 | 530,000 | -2.8 |
| 20-24..... | 1,314,000 | 1,342,000 | -2.1 |
| 25-29..... | 1,142,000 | 1,144,000 | -0.2 |
| 30-34..... | 756,000 | 736,000 | +2.7 |
| 35-39..... | 370,000 | 362,000 | +2.2 |
| 40-44..... | 94,000 | 92,000 | +2.2 |
| 45 and over..... | 5,000 | 5,000 | 0 |

¹ Projections based on assumption that 1950-55 trends in age-parity rates will level off by 1960. Both projected and actual numbers adjusted for under-registration.

² Actual figure is base in computation.

NOTE: For 1957 only provisional figures are available. The 1957 total, according to these figures, is 4,301,000, or only 0.3 percent higher than the projected total of 4,287,000.

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Cockroaches as Vectors

Recent publication of Medical and Veterinary Importance of Cockroaches by Lewis M. Roth and Edwin R. Willis (Smithsonian Publication No. 4299, 1957) has raised the question as to whether the cockroach is being neglected as a vector of infectious disease. It is well that the question is raised, because conventional assumptions in public health work deserve periodic appraisal and challenge. That the authors make no solid case for more energetic suppression of the cockroach as a disease vector does not detract from the utility of their work as a compendium of information that was formerly scattered to the far ends of the library shelves.

Cockroaches are recognized as mechanical transmitters of various pathogens, and because of this and their general obnoxious characteristics they have been and will continue to be the object of individual and community control efforts. The data presented only confirm this situation.

Roth and Willis have outlined the habits, habitats, and dispersal of cockroaches and the association of cockroaches with viruses, bacteria, fungi, protozoa, and helminths. They review bites and allergic responses, accidental invasion of man, cockroaches as human food, cockroaches in medicine and folklore, and diseases incorrectly attributed to cockroaches. They compare the significance of cockroaches and flies. Especially useful is their annotated list of pathogenic organisms and their reported association with cockroaches.

The authors undertake to prove that cockroaches are highly dangerous potential vec-

tors of disease. But the association of cockroaches with pathogens is yet to be adequately evaluated.

Epidemiologists do not consider that reports of the presence of pathogenic organisms on cockroaches is evidence that the species is a natural vector. Neither is survival of the pathogens after experimental inoculation in cockroaches proof that roaches are experimental vectors. Ecologic associations need to be demonstrated to support such a claim.

The work of Marcel Graffar and Simone Mertens (Ann. Inst. Pasteur, Paris, 79: 654-660, 1950) cited by Roth and Willis is the most persuasive study reported. These workers observed that during an epidemic of food poisoning new infections of *Salmonella typhimurium* occurred in spite of quick isolation of patients, the absence of healthy carriers, and the lack of detectable contact except through cockroaches. It was observed that cockroaches overran the nursery at night and *S. typhimurium* was isolated from cockroaches in the vicinity of the infants. The epidemic was checked immediately when the nursery was disinfected with DDT. The epidemiological data cited do not definitely incriminate cockroaches even in this instance.

Structural and ecologic adaptations of cockroaches which are conducive to their potential as disease vectors are widely recognized. One may well speculate as to why they are not more prominent as conveyors of pathogens. New evidence or reinterpretations of present evidence may eventually shed the necessary light.

—MELVIN H. GOODWIN, JR., PH.D., Chief, Phoenix Field Station,
Communicable Disease Center, Public Health Service

leveling off of the fertility rate as such, and it is useful in demonstrating the practical differences between projection results based on age-parity rates and those based on age-specific rates.

Comparison of Methods

For the purpose of comparing the two methods of estimating births, another projection, series C, was made for the 1956-65 period. Series C parallels series B in all respects except the method of measuring fertility. In series B, age-parity rates were used; in series C, age-specific rates. In both series, however, fertility was assumed to be the same in each year during the period 1956-65 as in 1955.

Table 6, which presents a comparison of the results of series B and series C projections, shows that there is an initially small but gradually widening gap between the total numbers of births obtained by the two methods, with series B yielding the larger numbers. By 1960, there is a difference of 2.5 percent, and by 1965 this gap widens to 4.8 percent. Differences for the individual age-of-mother groups are even greater. In 1965, for example, the projected number of births to mothers 30-34 years of age is 10 percent greater than the number obtained by the age-specific rate

method. At ages 35-39 years, the difference is 18 percent. It should be emphasized that these differences are a function of the specific assumptions of population composition and fertility in this particular situation. They are not necessarily the maximum differences that could result from the use of the alternative methods.

Conclusion

As stated at the outset, the illustrative projections presented here are not predictions. No effort has been made to prognosticate trends in the social, psychological, and economic variables affecting fertility. The parity-rate method of birth projection, like the age-specific rate method, is essentially a mechanism for translating assumptions of future fertility into numbers of births. The significant difference between the two methods is that the use of parity rates provides a greater degree of fidelity in the resultant translation.

The age-parity rate is, of course, not the ultimate refinement in fertility measurement. If adequate child-spacing and marriage-duration data were available, the additional use of these variables would permit further delineation as to fertility risk status, and probably would improve the stability of the time-series data forming the basis of fertility projections.

Table 6. Comparison of series B and series C for 1956, 1960, and 1965

[Numbers in thousands]

| Age of mother (years) | 1956 | | | 1960 | | | 1965 | | |
|--------------------------|----------|----------|--------------------|----------|----------|--------------------|----------|----------|--------------------|
| | Series B | Series C | Percent difference | Series B | Series C | Percent difference | Series B | Series C | Percent difference |
| Total..... | 4, 111 | 4, 088 | +0.6 | 4, 259 | 4, 155 | +2.5 | 4, 762 | 4, 545 | +4.8 |
| 10-14..... | 6 | 6 | 0 | 7 | 7 | 0 | 8 | 9 | -11.1 |
| 15-19..... | 505 | 506 | -0.2 | 596 | 599 | -0.5 | 739 | 737 | +0.3 |
| 20-24..... | 1, 283 | 1, 275 | +0.6 | 1, 346 | 1, 331 | +1.1 | 1, 632 | 1, 610 | +1.4 |
| 25-29..... | 1, 121 | 1, 117 | +0.4 | 1, 062 | 1, 038 | +2.3 | 1, 112 | 1, 072 | +3.7 |
| 30-34..... | 735 | 731 | +0.5 | 738 | 708 | +4.2 | 717 | 651 | +10.1 |
| 35-39..... | 363 | 356 | +2.0 | 402 | 372 | +8.1 | 426 | 360 | +18.3 |
| 40-44..... | 92 | 91 | +1.1 | 101 | 94 | +7.4 | 120 | 100 | +20.0 |
| 45 and over..... | 5 | 5 | 0 | 6 | 6 | 0 | 7 | 6 | +16.7 |

NOTE: Series C is base for computation of percent difference. A + sign indicates that the series B figure is the larger.

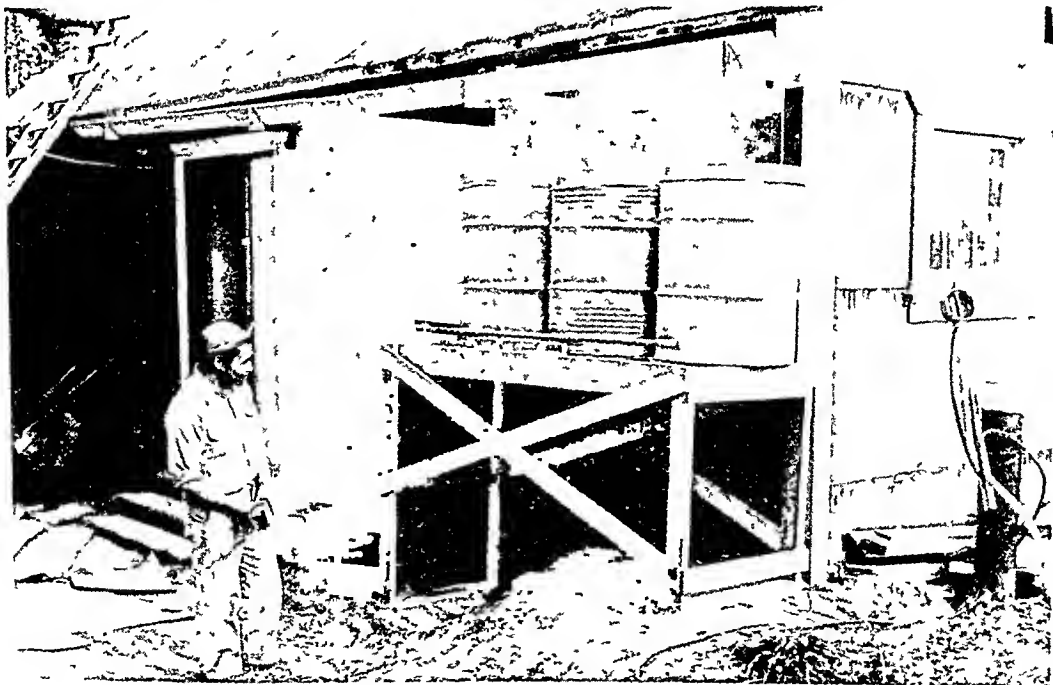
to be sanitation aides. In a month's course at the University of Alaska in Fairbanks, given by members of the department, a man from an Eskimo village learns ways of outwitting or using the harsh environment in practicing sanitation.

He learns about germs, as well as why and where dog teams should be tethered, about jetting wells through the permafrost, and how to use oil drums and sod pits in waste disposal. He also masters tools he may never have seen before and practices the techniques of persuading people to adopt the new devices he has learned to make.

When the sanitation aide completes the course and returns to his village, he is equipped with the tools he will need as well as his new knowledge. To a people accustomed to centuries-old ways, the Eskimo sanitation aides bring a chance for better lives. (Photographs were supplied by the Sanitation and Engineering Section, Alaska Department of Health.)



In fieldwork during the course at Fairbanks, aides fasten faucets in water barrels used to collect rain from the roofs in villages when other sources of water are lacking. The men learn to use tools, such as the knock out punch, which some have never seen before.



Teddy Brink of Kasiglook uses a level to check the slope of the barrel stand so that water will flow into the house even under a low head. A pebble tied

to the string hanging from the trough to the top of the barrel serves as an eave spout. Class project was installing rainwater system for this building.



Robert Cleveland, *left*, of Shungnak and Joseph Lomack of Akiachak make a laboratory slide as they learn about germs in the sanitation aides' course. A microscopic view of the bacteria of tuberculosis, a disease familiar to them, is a peek at a new world.

Eskimo Sanitarians

Providing isolated Eskimo villages on the shores of the Arctic Ocean with a safe water supply and adequate waste disposal is a challenge. Year-round permafrost, a frozen water supply, summer flies and mosquitoes, and a people bound by traditions are some of the obstacles to sanitation in such villages. But villagers are overcoming the obstacles with the help of the Sanitation and Engineering Section, Alaska Department of Health.

Under contract to the Alaska Native Health Service of the Public Health Service, the department in 1955 began training men, selected by their village councils,



Instructor Jim Savage, *third right*, shows village presidents, through a microscope, material removed from their teeth. To further the aides' future

projects in their own communities, the presidents of their home villages joined the students for the last week of the 1957 course at the University of Alaska.

The surgeon's personal attention to his patient and careful explanation of surgical procedures reduce apprehensions and aid recovery.

Psychological Preparation for Surgery

CHARLES S. BRANT, Ph.D., HERBERT VOLK, M.D., Med.Sc.D., and BERNARD KUTNER, Ph.D.

NEARLY all practicing surgeons would agree in principle that a total-care approach to the management of patients undergoing surgery should include careful psychological preparation. But such preparation for emotional and social problems resulting from hospitalization, surgery, convalescence, and rehabilitation is not always regarded as essential to comprehensive medicine, even though the literature attests to its importance. Kaufman (1) writing of the patient's need for emotional support, states:

"The patient must be emotionally prepared to accept necessary surgery without undue anxiety and fear. Everything must be directed toward reducing the psychological stress and trauma of anesthesia and surgery to a minimum. The patient must receive the emotional support he needs and deserves during the immediate postoperative periods. . . . A properly utilized half hour or hour of psychological preparation may give the patient sufficient emotional security to obviate preventable psychosomatic complications. Furthermore, it seems to me that such

briefing reduces the patient's anxieties and fears to such an extent that he takes the anesthesia better and has less postoperative pain and discomfort. . . . And he seems to make speedier recovery from the effects of surgery than the patient who is emotionally unprepared. This is equally true for emotionally normal patients as it is for neurotic patients."

Dyk and Sutherland (2) also stress the surgical patient's need for emotional guidance and rapport with his surgeon. In their study of colostomy patients they found that "anxiety and fear of injury, in some cases mounting to confusion, panic, or despair, were reported by all as reactions to impending surgery."

In another report, concerned with depressive reactions of patients to cancer surgery, Sutherland and Orbach (3), after speaking of anxieties about the nature of the disease, the impending surgery, possible death, or post-surgical social isolation and inacceptability, commented:

"These reactions are particularly prone to occur when the patient is unable to relate to medical personnel. . . . Mistrust is reinforced by the impersonality of clinic and ward procedures and the 'faceless surgeons.' To one depressed patient, surgery represented being cut up by a group of strangers."

Elsewhere, Sutherland (4) wrote: "Apparently prophylaxis is the best treatment. A warm relationship between the patient and the physician is essential. This relationship should permit the doctor to be seen as protective rather than threatening; it should permit easy com-

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Sanitation aides rig a tripod for exploratory jetting and drilling for water. Fieldwork was done in the university's geophysical area.



Cutting and threading water pipes are tasks new to them, but Herb Apassingok, *left*, of Gambell, and Teddy Brink readily master the skill.



Tom Brown, *left*, of White Mountain and Wilbur Karmun of Deering complete a grate for an incinerator. In an Eskimo village, dog food would be heated on top of the drum while trash was



burned inside. *Right*. Students prepare training aids they will use to introduce new devices in their home villages. Community education methods are a part of the aides' course.

sample of the resident surgical staff and graduate nurses on the surgical wards, and informal interviews, of varying length and depth, with a sample of interns serving on the surgical service. We also observed interactions between physicians and patients receiving treatment on the wards, during teaching rounds conducted by the attending surgeons and in the recovery room.

Results

Some qualitative findings from the study throw light on the question: What are the inherent problems, difficulties, or obstacles in developing total care for surgical patients in a teaching hospital setting? Other findings from this study have been presented in somewhat different contexts (8,9).

Case 1. A 66-year-old retired, unmarried, white woman came to the hospital because she had noticed 2 weeks earlier two small lumps in one of her breasts. When she noticed the lumps, the patient stated, she believed they were due to nervousness, for which she sought relief. In the clinic, the physician said that the lumps were "something serious" and that she should enter the hospital for treatment. At that point, the patient asked if she couldn't go home and return in 2 days, a request made, she admits, for the purpose of avoiding hospitalization. She was dissuaded from this course and admitted to the inpatient surgical service.

Following admission, the surgical staff decided that the patient should have a biopsy and possibly a radical mastectomy. The intern assigned to the case told the patient it was necessary to remove "a little" of the lumps, that then they would probably "go further" with surgery, perhaps removing the entire breast, although they hoped it could be avoided, and that following this surgery, the patient would receive "some treatments." The patient ventured anxiously, "I hope it's not too serious." The physician replied, "No, no. Now you just smile and don't worry." The patient then signed the consent-for-surgery form and the intern left. The patient stated in the preoperative interview that she was nervous and afraid of surgery and recalled postoperative pain from a hemorrhoidectomy some

years earlier. She added that it was a shock to her to come to the hospital for relief of nervousness and be hospitalized for surgery.

The surgery consisted of a biopsy and simple mastectomy, followed by radiotherapy.

At postoperative interview, the patient stated that going to the operating room she felt frightened and worried about survival, and regretted she didn't tell her friends goodbye, just in case she didn't return. When she awakened from anesthesia, she knew vaguely that she was "somewhere"; she heard only footsteps and it seemed very quiet. Her first feeling was again of being afraid and wondering if her breast was gone. This question went unanswered until the morning of the first postoperative day, when the intern told her only a small portion of the breast was removed and that she would receive "at least two" radiotherapy treatments. The patient thought she still felt a lump, and the intern explained that what she felt were sutures. The patient told us that she wanted to know what caused her trouble and what she would need to do to care for herself at home but felt "too timid" to ask questions of the doctors.

A few days after the operation the patient received her first radiotherapy. Interviewed the following day, she stated that the experience was very frightening: The sight of instruments on a table in the radiotherapy room made her fearful that further surgery was planned, and the radiotherapy equipment itself upon being lowered over her, was fear provoking. Nothing the patient could recall indicated that the radiotherapy procedures had been explained to her.

Here we see manifestly an anxious, elderly lady, in whom ignorance concerning cancer and denial of the illness was operating. Proper psychological management of her case requires a fuller understanding of her emotional responses to the ominous news of possible major breast surgery and even death. Fear of surgery, concern over removal of a breast, and anxiety about one's death are the most common emotions found in patients with breast disease. If they are not dealt with directly, patients tend to return from surgery with unrelieved apprehensions.

Case 2. A 50-year-old white salesman w

munication and discussion of irrational beliefs and misconceptions. . . .

"A good patient-physician relationship, beginning with the initial diagnostic examination, is the patient's best guarantee against the development of crippling beliefs and their expression in unnecessary restriction of activities."

Others have emphasized the surgical patient's need for information and explanation. For example, the widely known standard textbook, Babcock's *Principles and Practice of Surgery* (5), states:

"Perhaps the best preparation for surgery is for the patient to know his surgeon. Many times contact with the surgeon is so limited that countless questions go unanswered, causing the patient great worry. It is necessary for the surgeon to explain the purpose of the surgery. While this may be quite obvious to him, it is not always obvious to the patient. . . . Patients want to know what is to be done and why."

In an essay written in 1928, Cabot (6), referring to the impact of the hospital environment upon the patient, said: "The patient finds himself facing a new and often terrible situation. To enter the hospital is often for him the most momentous event of his life, and he needs all the help that can be given him to understand it."

Although every physician appreciates the importance of a sound physician-patient relationship, and every surgeon knows that his patient is a sentient human being with hopes and fears that affect his attitudes toward treatment, we have found that the interpersonal and communicative aspects of the physician-patient relationship in surgical practice are comparatively too often neglected. Generally, in private surgical practice, the physician is keenly aware of his patient's needs. However, since a substantial number of surgical patients receive care from physicians in surgical residency in government-supported hospitals, gaps may appear between patient needs and surgical practice. In 1954, an estimated 1,657,550 surgical patients were discharged from government-supported hospitals in the United States (7). Presumably, the resident staff treated the vast majority of these patients as well as an un-

determined proportion of some 6½ million surgically discharged patients in non-government-supported hospitals.

Purpose of Study

The teaching hospital is one strategic setting for developing in young physicians a comprehensive approach to medical care centered upon the patient. It is here, as intern and resident, that the young physician may acquire, through intensive instruction and by demonstration, example, and practice many of his most important skills and his basic attitudes about patient care.

In order to examine relationships and attitudes between physician and patient, we undertook an exploratory study of the surgical service of the Bronx Municipal Hospital Center, which is the teaching hospital of the Albert Einstein College of Medicine, Yeshiva University. Most of the patients, house-staff members, and nurses interviewed and observed were on the general surgical service. The study was conducted during the second year of the hospital's existence, a period when the organization of services and activities was formative rather than firmly established. Other relevant background factors were: (a) the medical school with which the hospital is affiliated was also in its second year of existence; students, therefore, had not yet begun serving clinical clerkships; (b) the surgical service was frequently extremely busy, with wards filled to capacity or nearly so; (c) there was an acute shortage and considerable turnover of experienced graduate nurses, practical nurses, and nurse's aides; (d) emergency cases constituted a large percentage of the total work of the surgical service; and (e) the patient population was largely geriatric immigrants of European origin and had language difficulties and environmental handicaps.

Procedures

Before and after operations, we interviewed 50 surgical patients, unselected except for diagnosis. The selected diagnoses were gastrointestinal, genitourinary, gall bladder, peripheral vascular, respiratory, and skin disorders. Formal interviews were held with a

Case 4. A 47-year-old married man was sent to the hospital by his private physician, who had told him that an X-ray showed a shadow on part of one lung and that this might be a tumor. He was given the same diagnosis by staff physicians in the hospital.

The patient's conception of the intended treatment was "an operation on the part of the lung with the shadow." This was to be done the following day.

Asked if he had questioned the staff physicians about his illness or the planned surgery, the patient said: "Oh, yes. The doctors told me they would like me to ask them about anything that was on my mind. I wondered if the tumor in my lung couldn't be cured by radium. They explained that the best way to be sure I would be cured would be to take the tumor out completely. I believe I really felt a little afraid of an operation on my lung since my family doctor wouldn't even do one on the hernia that I've had a long time. I told the doctors here about this, and they explained to me that this was because the lung problem was more urgent. They assured me that all the tests showed my general health was sound and that I could take the lung surgery without any danger." The patient added that he felt very relieved to have had things cleared in his mind through discussion with the staff physicians, because he had been quite upset when he first learned he required lung surgery.

Interviewed after the operation, the patient related that he felt he was getting fine treatment and singled out the staff surgeon's visits and comments about his progress as making him feel better both physically and mentally. His only problem was wanting to get up and around a little sooner than the surgeon wanted him to.

This case demonstrates as clearly as any studied the value of briefing the patient factually about postoperative events: He knew that he would awaken in the recovery room, where special care would be given; that he would be expected to cough, and the reason why; that there would be a drainage tube coming out from the operative area; that he would be on a restricted diet for a time; and that he would begin ambulation about 2 days postoperatively.

Discussion

We introduced the above case studies with a question to which we now return: What are the inherent problems, difficulties, or obstacles in developing total care for surgical patients in a teaching hospital setting? Perhaps the central problem lies in the house officer's definition of his tasks in medical care and the purposes served by the institution. Quite obviously, he is there to learn, and to service hospital patients. Indeed, one may say that his purpose is to learn through serving. In the process of being a physician, he acquires knowledge and skills and extends his experience, which in turn make him a better physician. For the resident, the purpose is to learn to be a surgeon; for the intern, it is to learn more about surgery and care of surgical patients, perhaps as a preliminary to entering surgical residency training, perhaps only as part of general medical training.

The matter becomes somewhat more complex, however, when one goes beyond the obvious functions of the house officer and asks: What, is his conception of his role or task? What does he regard as relevant and significant knowledge to acquire, and what services should he provide? We find, in answer to these questions, that the house officer is more often than not preoccupied with the technical and mechanical aspects of surgery. The desire to communicate with the patient and to develop sound interpersonal relations is regarded as a luxury not expected in nonprivate practice. The ways in which these views are manifested vary from patient to patient and have differing consequences, as the illustrations indicate. In case 4, where the preparation for surgery was exemplary, the patient went to surgery with minimal anxiety and during postoperative convalescence cooperated fully and cheerfully, because he understood what was necessary and required of him.

Recommendations

Planning for the development of an improved program for the total care of surgical patients in teaching hospitals must include standards for house staff practice and means of implementing these standards. Standards of practice should incorporate the following:

a long history of diabetes entered the hospital with circulatory insufficiency in the right leg. He was scheduled for a below-knee amputation and subsequent transfer to the rehabilitation service for reambulation and prosthesis.

Prior to admission, the patient had been treated unsuccessfully for almost 1 year at several hospitals. The interview disclosed that the failure of therapies had led the patient to lose considerable confidence in physicians. While on the operating table under spinal anesthesia at another hospital, the patient had been acutely distressed upon hearing the surgeons dispute improper functioning of their equipment. This caused him to feel he was in the hands of incompetent people.

The patient, accustomed to a very active life, was most anxious to learn how long his treatment and rehabilitation would keep him from returning to work. He felt that the year already consumed was "like a lifetime." Five days after the operation, one physician informed the patient that he would go to the rehabilitation service soon, and in "no time at all" he would be up and on his way home. He was also assured that a modern prosthesis is usually easy to fit and to use.

Unfortunately, the patient developed a wound infection which necessitated continued treatment on the surgical ward. He developed a reactive depression and complained vociferously. The intern assigned to the case was annoyed by the patient's temperament and demands, feeling there was nothing he could do for the patient beyond changing his dressings daily.

When the infection cleared and the patient was transferred to the rehabilitation service, he stated that he felt much better because now he was "getting somewhere."

This case reveals the need to counsel the patient who has been through prolonged and varied therapy without positive result so that he may understand the rationale of the planning and maintain his confidence in the medical profession. It points up the consequence of overoptimistic and unqualified statements about the length of treatment and rehabilitation, and the need to apprise the patient realistically of what lies ahead before he can resume his regular activities. As for a patient with major

rehabilitation facing him, the doctor's role is by no means confined to the immediate medical treatment. The intern, in this particular case, instead of reacting with a sense of personal annoyance to his patient's anxieties, might have devoted some time to psychological support and viewed his patient's temperamental response as an aspect of the patient's anxiety about the future.

Case 3. A 17-year-old high school girl entered the hospital complaining of dysuria. She was scheduled for cystoscopy 2 days later.

When interviewed, the patient was asked to relate what she believed her trouble was and what the doctors were planning to do for her. In an angry mood, she said: "Dr. L. said they are going to do some kind of examination on me, tomorrow, I think. They say there is something wrong with my kidneys, but they didn't say what. I'd like to know why a young person like me should have kidney trouble, but Dr. L. is always rushing around all the time and I don't get a chance to ask him anything. He doesn't talk to you like a patient." When asked what she meant by the last sentence, the patient said that she had been in another hospital where the doctors explained things to her.

On the day of the scheduled cystoscopy, the interviewer learned that it had been cancelled because the patient's parent had not come to the hospital to give consent for the procedure. The patient had learned that the proposed examination was a cystoscopy, and, having previously had this procedure and finding it painful, prevailed upon her parent not to consent. The patient was discharged to be followed in clinic.

It is evident that in addition to being anxious about a painful diagnostic procedure, the patient wanted the physician to tell her the reason for her illness and the procedure that would be followed. The physician-patient relationship was so undeveloped and communication with the patient was so minimal that the patient acted against medical advice and her own interests. The value of forthright, even if brief, explanation of procedures and planning, presented in a manner that will not alarm the patient, cannot be overestimated. An impersonal attitude toward the patient is one of the contributing factors in the failure of patients to follow medical advice.

plex field leave little opportunity for him to become versed in the recognition and management of a patient's psychosocial needs. Such needs are recognized in surgical literature and by experienced practitioners and teachers of surgery, but they are often inadequately met. Standards of practice as well as steps to implement them are outlined, so that ideal surgical practice with respect to these needs may be approximated in the teaching hospital.

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Textbook on Medical Care Organization

More than a hundred articles on the organization of medical care are brought together in the recently published textbook entitled "Readings in Medical Care," edited by the Committee on Medical Care Teaching of the Association of Teachers of Preventive Medicine.

The book contains basic studies dating back to the 1920's as well as important recent ones in books, journals, and monographs, together with extensive reading lists. Several articles appeared in *Public Health Reports* and other government publications, and many are the work of Government employees or former employees, printed elsewhere.

Prepared in response to a widely felt and frequently expressed need for teaching material, the new textbook grew out of a conference on preventive medicine in medical schools held in Colorado Springs in November 1952. This conference was sponsored by the Association of Teachers of Preventive Medicine and the Association of American Medical Colleges.

"Subsequent to that searching exploration of the growing importance of preventive medicine in medical education," Dr. George Packer Berry, of Harvard University, says in the foreword, "the Committee . . . have devoted their efforts to understanding, evaluating, and recording changes in the patterns of organization of medical care and health service."

1. In addition to the basic physiological preparation of the patient for surgery, attention should be given to psychological factors. During, immediately after, and at regular intervals following admission to the surgical service, the medical staff alone or in conjunction with nursing and social work personnel should evaluate, by physiological and discursive means, the level of and changes in the patient's anxiety about hospitalization and surgery.

2. Hospital rules and regulations and normal procedures of examining, testing, and caring for vital functions should be explained to the patient upon admission and thereafter as indicated.

3. When the time for surgery has been scheduled, the patient should be informed as promptly as possible. Such information should be withheld until the last possible moment only in those instances in which receipt of such information is felt to be detrimental to the patient's general health.

4. In every instance the nature of the operation and the reasons for its being performed should be explained to the patient in terms he is capable of understanding, without necessarily revealing the diagnosis if this is deemed inadvisable (for example, to remove an "obstruction"; to "relieve pressure"). The patient or his family should not be guaranteed by the house officer the successful outcome of surgery.

5. In every instance the choice and type of anesthetic to be used should be explained to the patient by the anesthesiologist on the day of or evening preceding the operation. Whenever possible, such explanation should be given in emergency cases.

6. Preoperative preparation should include explanation of the physical preparation, transportation to the operating room, nature of the operating room, use of the recovery room (in cases where it is used), and length of time that will elapse before return to the ward.

7. Explanation of postoperative pain and other discomforts should be given the patient in advance of surgery.

8. Before the operation, the patient should be prepared for postoperative parenteral alimentation, drainage tubes, dressings, respira-

tory activity, range of mobility, and time of ambulation.

9. After the operation it is the surgeon's responsibility to discuss the results of surgery, the probable consequences, and the anticipated length of hospitalization and convalescence.

10. The surgeon should discuss the operation and its consequences with the referring physician and responsible members of the patient's family.

The means by which these standards of practice may be implemented are:

1. At the start of the hospital year, the house staff should be oriented through lectures, films, articles, and demonstrations dealing with the total care of surgical patients.

2. At evaluation conferences, house staff members (residents universally and interns where possible) should be given an opportunity to present cases completely worked up from surgical, social, and psychological points of view.

3. Each resident should be given specific instruction and supervision in the psychosocial, presurgical preparation of his patients and in the psychological, postsurgical management of his patients.

4. Teaching rounds should include a psychosocial evaluation of the patient's status and specific coverage of patient responses to the outcome of surgery.

5. Each resident should be instructed and supervised in methods of interviewing the patient and discussing with him and his relatives his problems.

6. Responsible senior surgeons periodically should rate and discuss ratings with residents and interns on the house officer's performance of the psychosocial aspect of his work as well as other aspects.

7. Psychiatrists, social workers, and social scientists should collaborate in these activities designed to improve physician-patient relationships.

Summary

For the surgeon-in-training, the exigencies of a heavy work schedule, large patient load, and necessity of mastering the specialized knowledge and techniques of an increasingly com-

Transfer in San Martín

After 11 years of work by Servicio Cooperativo Interamericano de Salud Pública in San Martín Department, in January 1958 we turned over the health unit to Peru's Ministry of Health. Since 1946 SCISP has gradually developed public health and medical care services for the 400,000 people living in this high, jungle area.

The health unit for San Martín consists of a 50-bed hospital and health center in Tarapoto, a health center in Moyobamba, medical posts in Lamas, Rioja, Juanjui, and Saposoa, and 15 health posts in the smaller towns. In accepting responsibility for the health service, the government of Peru assumed a yearly financial obligation of approximately \$130,000, or 3.5 million soles.

—FREDERICK J. VINTINNER, Sc.D., M.P.H., *chief, Division of Health and Sanitation, U. S. Operations Mission, Peru.*

The Road Back

The small government hospital in Voinjama, district and provincial headquarters of Liberia's Western Province, is the center of a proposed project to combat sleeping sickness. Because the trucks that brought supplies to the hospital often took a week to get there from Monrovia, the capital, and this transportation cost \$350, I decided to investigate the logistics of providing services to Voinjama myself.

I made the 200-mile trip to Voinjama in 2 hours in a light plane, but returning to Monrovia in a 4-wheel drive jeep took far longer. The road back goes through French Guinea so visas and re-entry permits had to be arranged. The first leg of the jeep journey ended at Macenta, 36 miles and 4 hours from Voinjama. We were told we had made excellent time; frequent rains turn the laterite of the roads into mud paste, but our jeep was stuck only once, in front of the French customs station.

On this trip I developed an essential skill, bridge building. The ordinary ones are made of logs placed lengthwise across streams. Frequently the wheels of a truck force the logs apart and the truck tumbles into the stream or its axles are suspended on the logs.

After stopping overnight in Macenta, we left early the next morning for N'Zérékoré, still in French Guinea. On the way we crossed the St. Paul River.

Vehicles are ferried across its 100 yards on a hand-pulled barge, but travelers on foot use the famous "monkey bridge," constructed entirely of long vines twisted together to make two handrails connected by a sling. I stepped gingerly across the swaying span which tightens and dips at each step but ingeniously serves its purpose, except when rotting vines are not replaced.

We reached N'Zérékoré, the second overnight stop, after driving the 61 miles in 7 hours. Next morning we drove to Ganta on the Liberian side of the border and made the final leg of the journey to Monrovia in about 8 hours.

When the new road is completed, getting supplies to Voinjama will not be so difficult, and air service to the town may soon be started by Liberian National Airways.

—JAMES P. WARD, M.D., *chief public health and sanitation division, U. S. Operations Mission, Liberia.*

The Spring

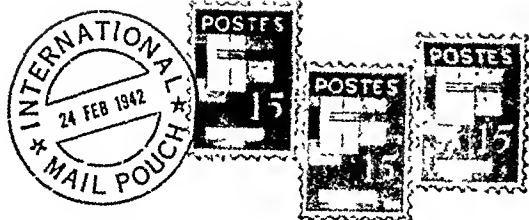
Rurrenabaque, a little town in the jungle uplands of Bolivia, was not far from a clear spring at the base of a cliff which could amply serve 5,000 people. The spring was high enough to feed the town by gravity flow. But the people could scarcely reach the spring on foot and Servicio engineers faced formidable obstacles to bring the water to the town in channels.

No road from La Paz, 150 miles distant, led to Rurrenabaque. Planes ferried in most of the equipment and materials needed to convert the spring into an accessible water supply. The dynamite for blasting came part of the way by truck and then by mule pack and canoe to the remote site.

No machines of any size could be used at the spring itself. Drilling for blasting operations had to be done by hand. The piers, heavy pieces of timber 25 feet long and each weighing more than a ton, had to be carried by men through the tropical forest. A human chain passed along the stones for the foundations of the piers.

After more than a year of such labor by the townspeople, the fresh, clear water of the mountain spring flowed into Rurrenabaque.

—HARALD S. FREDERIKSEN, M.D., *chief, health and sanitation division, U. S. Operations Mission, Bolivia.*



Korean Texts

Nurses in Korea will soon have five Korean texts to aid them. The medical care bureau of the Republic of Korea's Ministry of Health and Social Affairs recently issued Basic Nursing Methods and Nursing Care of Pregnant Women, and the Korean Nurses Association has ready for publication two other texts, Medical Nursing and Nursing Care of Children. The Korean Red Cross is planning to publish Home Nursing, which will be a useful reference for public health nurses, home economics teachers, and other professional workers as well as individual families.

—ALFRED S. LAZARUS, PH.D., acting chief, Health and Sanitation Division, U. S. Operations Mission, Korea.

Pipeline

In one day, 100 villagers of Sapum, Thailand, built a pipeline to bring water to their small community from the nearest source, a hillside spring half a kilometer away. After several outlets were installed in the village, the people decided to build a storage tank at the spring and additional branch lines from the main distribution line to more remote parts of the village.

The people volunteered their labor, and the local health department provided the materials for the distribution system.

—ROBERT L. ZOBEL, M.D., chief, Health Division, U. S. Operations Mission, Thailand.

Male Nurses

When the 17 men who started courses in February 1958 at the School of Nursing, Tubman National Institute of Medical Arts, Monrovia, are graduated, this profession may gain new status in Liberia.

Six men and twelve women are taking the 3-year course in professional nursing, and 11 men and 3 women are in the 2-year course for practical nurses.

The 8 students who will study midwifery for 2 years are women. These candidates for the school were selected from a much larger group by written examinations, given in many of the smaller towns as well as the capital, and personal interviews.

Only five of the students come from Monrovia: most are from much smaller towns and the rural areas. Eight are high school graduates, 13 have attended high school, and 15 completed the eighth grade. Their ages range from 16 to 34 years, with 23 as the average age in the professional nursing and midwifery courses and 22 in the practical nursing course.

The students listed their fathers' occupations on application blanks. Most of their fathers are farmers or fishermen, a few are teachers, and three are tribal chieftains.

—JAMES P. WARD, M.D., chief, Public Health Division, U. S. Operations Mission, Liberia.

Sick Students

Fifty candidates came to take the entrance examinations at Itegue Menen School of Nursing in Asmara, Ethiopia. Of the 26 accepted after examination, it was necessary to treat 12 for trachoma, 14 for amebiasis, 2 for congenital syphilis, and 1 for ascariasis.

—A. C. CURTIS, M.D., chief, Public Health Program, U. S. Operations Mission, Ethiopia.

Occupational Health in Peru

The Peruvian National Association on Occupational Health was formed after Peru's first national seminar in this field was held in January 1958. The medical directors and safety engineers of many industrial and mining companies in Peru as well as private physicians, nurses, and public health workers were among the 94 persons attending.

The seminar participants included faculty members from Harvard University, Marquette University, Peru's National University of Engineers, and San Marcos School of Medicine, the Peruvian and the United States consultants in industrial hygiene, and representatives from Brazil, Colombia, Bolivia, and Venezuela.

—FREDERICK J. VINTINNER, Sc.D., M.P.H., chief, Division of Health and Sanitation, U. S. Operations Mission, Peru.

children were to be transported. Teachers were also helpful here. In rural areas, parents provided transportation for the students; in the villages, school buses were used.

Education

Since approximately 50 students were to be brought into the health center at a particular time and remain there for half a day, the health educator planned dental health classes for them. The students were divided into three groups, each designated by colored molars pinned to dresses and jackets, and while some students were passing through dental offices for X-rays and examinations, others were being rotated through classes on dental health, nutrition, and sanitation.

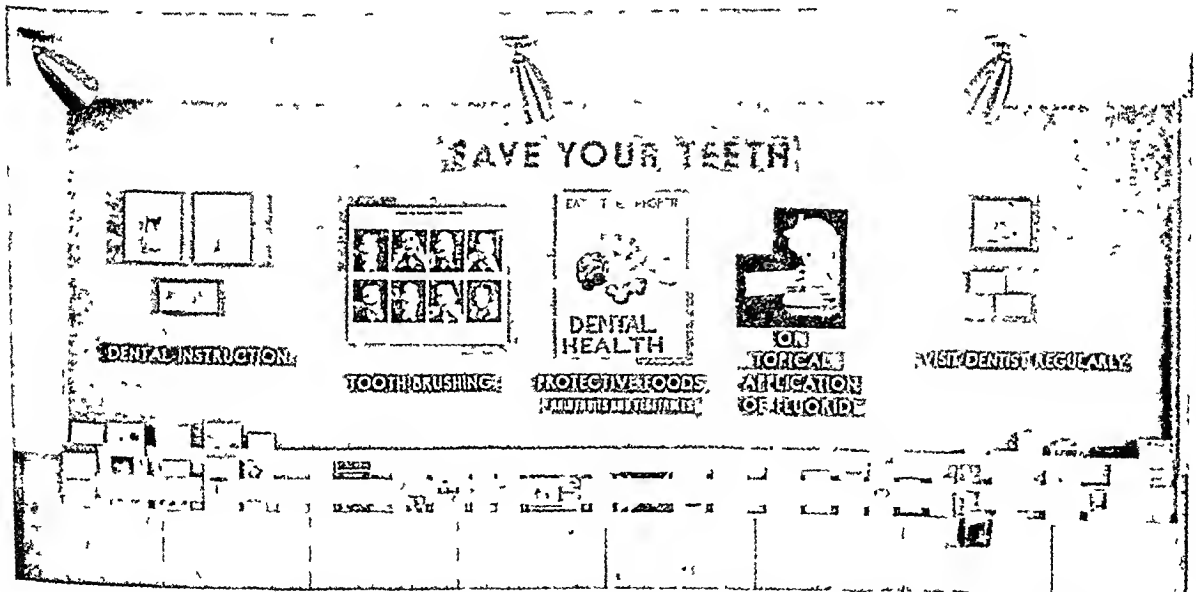
Following is a brief summary of the material presented in those classes:

- **Dental Health.** The objective of this class was to increase the students' interest in the proper care of their teeth. Class instruction included a review of the anatomy and general structure of teeth and emphasized the importance of having and maintaining good teeth. Theories and causes of dental caries were discussed along with the means by which tooth

decay may be prevented and controlled. Proper toothbrushing, selective diet, fluoridated water or topical application of fluorides, plus the most important factor, regular dental visits, were stressed as the principal factors in good dental health.

- **Nutrition.** The objective was to develop a favorable attitude toward a nutritionally balanced diet and an understanding of the kind and quantity of foods necessary for dental health. The nutritionist demonstrated with prepared meals the seven basic food groups (see illustrations) and pointed up the value of a good breakfast. Students were taught to select as afternoon snacks such foods as fresh fruits, fruit juices, carrot sticks, celery, and milk that leave the mouth quickly and are less cariogenic than sweets, which are normally eaten.

- **Sanitation.** Sanitarians showed tests of contaminated water supplies and explained how such supplies become contaminated. The importance of pasteurizing milk was presented. Other sanitation services that were described included restaurant inspection, nuisance abatement, mosquito control, and laws pertaining to offensive trades, such as the operation of slaughter houses.



The health educator used this dental display in summarizing proper toothbrushing, selective diet, fluoridated water or topical application of fluorides, and regular dental visits as the principal factors in good dental health.

A 20 percent reduction in the incidence of caries was obtained from one application of an 8 percent stannous fluoride solution.

Stannous Fluoride Clinical Study in Olmsted County, Minnesota

WILLIAM A. JORDAN, D.D.S., M.P.H., JOHN R. SNYDER, D.D.S., and VIKTOR WILSON, M.D., M.P.H.

RESEARCHERS have shown that stannous fluoride applied topically reduces dental caries (1, 2), and some of their studies have demonstrated that an 8 percent solution of stannous fluoride is superior to a 2 percent solution of sodium fluoride (3).

To provide further information on the value of stannous fluoride as a caries inhibitor, we selected all 7th and 8th grade students in the rural and village schools of Olmsted County, Minn., for our study. This group was the most accessible and also had the greatest number of permanent teeth. Of those eligible, 510 (95 percent), between the ages of 12 and 13, signed up for the study with permission from their parents or guardians.

The Rochester-Olmsted County Public Health Center was chosen as the examining and experimental site because the personnel in its health unit were interested and because its facilities were available. The study was planned to cover 2 years.

Cooperation was then obtained from groups involved or interested in the study: the Roches-

ter Board of Public Health and Welfare, the Olmsted County Board of Health, the Rochester Dental Society, rural and village school officials (including the county superintendent), parents (through the PTA), and teachers (at a teachers' institute). The teachers, who interpreted the facts of the study to students and parents, were indoctrinated at the institute, in an article in their newsletter, and by means of radio, television, and news releases. The county's public health nurses also aided in this respect. All contacts were made during the summer months before schools opened.

Planning Committee

A planning committee composed of a health officer and the health educator of the Rochester-Olmsted County Health Unit, the staff of the Minnesota Department of Health Section on Dental Health, and public health nurses outlined a schedule of 50 examinations per half day. The scheduling was based on a school day which consists of 6 hours. This allowed approximately 3.6 minutes for each dental examination and the same time for the four X-rays taken by another public health dentist.

Since the students came from rural and village schools outside the city of Rochester, arrangements were made to transport them to the health center at specified times. Public health nurses informed all rural and village schools of the timetable and the means by which the

Dr. Jordan is chief, and Dr. Snyder is assistant chief, section of dental health, Minnesota Department of Health. Dr. Wilson is health officer for the Rochester-Olmsted County Health Unit. This study was sponsored by the section of dental health and the health unit and aided by a grant from the Public Health Service.

Table 1. Incidence of caries after a single application of 8 percent stannous fluoride solution to erupted permanent teeth of children 12-13 years of age, at the end of 1 year

| Location of new caries | Control group (N=238) ¹ | Experimental group (N=234) | Difference between groups | Reduction in percent | P |
|------------------------|---------------------------------------|----------------------------------|---------------------------------|-------------------------|--------|
| Teeth..... | 2.15 ± 0.112 | 1.72 ± 0.108 | 0.43 | 20.0 | 0.0052 |
| Surfaces..... | 4.79 ± 0.229 | 4.10 ± 0.221 | .69 | 14.41 | .0308 |

¹ Some teeth thought to be carious when first examined were subsequently found to be noncarious. The incidence of reversed diagnosis was 0.265 for the control group and 0.360 for the experimental group.

faces, as compared with means of 9.560 DMF teeth and 16.240 DMF surfaces for the experimental group. The two groups were practically identical with regard to DMF teeth and surfaces.

Following the initial examination the students were rescheduled for treatment at the rate of 12 to 14 per day, and the information was sent to their schools. Conscientious cooperation of parents in the rural areas helped keep the schedules running as planned. Cancellations or changes in time by individual students were practically nil.

The treatment began with prophylaxis by the hygienist. The teeth in one half of the mouth, upper and lower quadrant, were isolated by cotton rolls, with holders used to keep the rolls in place. A continuous roll was used on the buccal side for the upper and lower teeth. The teeth were then dried by compressed air.

During this procedure the assistant prepared a fresh solution of 8 percent stannous fluoride by dissolving 0.8 gm. of stannous fluoride in 10 cc. of distilled water.

The solution was applied to the clean, dry teeth by a cotton swab, and the teeth were kept wet for 4 minutes. A timer was used to assure uniform applications. The other half of the

mouth was then treated in the same manner. It requires approximately 30 minutes to give a good prophylaxis and a complete topical application of stannous fluoride.

The control group received prophylaxis followed by a water treatment under the same procedure as the treated group.

(An agreement was made with the parent and students of the study that if the study produced favorable results all the students in the control group would receive treatment at the end of the study if they desired.)

Followup Examination and Findings

At the end of the first year, the same public health dentist conducted a followup examination in the same manner as the original examination. Nearly as much time was devoted to planning schedules and appointments for the series as for the original series. A followup session devoted to dental health education was also planned to evaluate the first education program.

Of the 510 students originally examined, 4 were reexamined, 238 in the control group and 234 in the experimental group. As table 2 shows, 20 percent fewer new dental caries were

Table 2. Comparison of caries in surfaces of teeth of experimental and control groups following single application of 8 percent stannous fluoride solution to erupted permanent teeth of children 12-13 years of age at the end of 1 year

| Surface | Control group (N=238) | Experimental group (N=234) | Difference | Differences in percent | P |
|-------------------|--------------------------|----------------------------------|------------|---------------------------|--------|
| Proximal..... | 2.96 ± 0.169 | 2.35 ± 0.143 | 0.61 | 20.60 | 0.0001 |
| Occlusal..... | 1.24 ± 0.097 | 0.98 ± 0.088 | .26 | 20.96 | .0001 |
| Buccolingual..... | 0.59 ± 0.051 | 0.77 ± 0.082 | -.18 | -30.50 | .0001 |



Practical help in setting up eating patterns for a day was given students participating in the Olmsted County, Minn., stannous fluoride study.

Following an evaluation and summation of the three sessions, a dental health film, *The Gateway to Health*, was shown and discussed. The dental director briefly explained the future plans of the study and what was expected of each student.

In an effort to obviate the use of any fluoridated toothpaste by members of the control and experimental groups, a nonfluoride dentifrice was distributed among them before they returned to their schools. The students were able to obtain additional supplies from the county's public health nurses when the nurses visited the schools, or by coming directly to the health center. Records were kept on the distribution of the toothpaste.

Procedures

The students were assigned in groups of 50 per half day for examinations and X-rays. All received a complete mouth mirror and explorer examination from Dr. William A. Jordan, who used a Burton lamp to illumine mouths adequately. Two posterior bitewing X-rays and one upper and one lower X-ray of the anterior teeth were taken by another public health dentist.

In order to start this study on relatively even terms, the students were divided into two groups comparable in caries experience. The control group had a mean of 9.582 decayed, missing, or filled (DMF) teeth and a mean of 16.373 decayed, missing, or filled (DMF) sur-

Status of **TUBERCULOSIS**

CONFERENCE REPORT

Tuberculosis, still one of this country's most costly infectious diseases, engaged the attention of 3,000 physicians, public health workers, and nurses at the 1958 annual meetings of the National Tuberculosis Association and its medical section, the American Trudeau Society, and of the National Conference of Tuberculosis Workers. The meetings were held concurrently May 19-22 in Philadelphia.

Although tuberculosis was the focal point of the meetings, nontuberculous diseases of the lung and cardiovascular diseases also were discussed, reflecting the broadening interests of the groups. Following a brief summary of tuberculosis facts and figures compiled by the National Tuberculosis Association, highlights of selected scientific papers are presented.

Tuberculosis Facts and Figures

★ Approximately 800,000 people in the United States have tuberculosis, either active or inactive, but in need of medical supervision.

★ Between 50 and 55 million people are infected with the tubercle bacillus.

★ Approximately 90,000 new cases are reported each year, almost 70,000 of which are active cases.

★ The disease causes about 14,000 deaths a year.

★ Tuberculosis costs the United States approximately \$725 million a year, according to a study by the Public Health Service based on 1956 figures.

★ Three principal drugs used in treating tuberculosis are, in the order of discovery, strep-

found in the experimental group than in the control group. The probability of .0052 indicates 20 percent is statistically significant. Surfaces of teeth in the experimental group were 14.1 percent less carious than in the control group.

Table 2 shows the difference in the incidence of caries between the two groups with regard to specific DMF surfaces. The proximal surfaces of the treated group were 20.6 percent less carious than the same surfaces of the untreated group. This is statistically significant. The occlusal surfaces in the treated group showed a 20.96 percent reduction as compared with the control group. The probability of .0478 is just barely significant.

There was a reverse result, inexplicable at present, in the buccolingual surfaces where 30 percent more caries were found in the experimental group than in the control group. The analysis at the end of the second year may shed some light on this situation.

In conjunction with the educational feature of the study at the followup examination, the children were given an evaluation checklist on the subject matter presented the previous year. The children, from five different schools, answered between 70 and 75 percent of the questions correctly. Since there was no original evaluation of the education on dental health, nutrition, and sanitation, no comparison could be made.

Summary and Conclusion

An 8 percent stannous fluoride solution, applied once to erupted permanent teeth, was

tested in students aged 12 and 13 years in Olmsted County, Minn., to determine the solution's ability to inhibit caries for 1 year. The 510 students were divided into almost identical control and experimental groups. At the end of 1 year, 472 students returned for examination. Compared with the control group, the experimental group had 20 percent fewer carious new teeth and 14.5 percent fewer new carious surfaces. Proximal and occlusal surfaces benefited from the treatment.

A second application of the solution was made at the end of the first year and its effects will be studied this year.

The students were briefly schooled in dental health, nutrition, and sanitation simultaneously with the examinations at the Rochester-Olmsted County Public Health Center. One year later the children were able to answer correctly between 70 and 75 percent of the questions put to them on the subject matter taught.

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Research Fellowships in Clinical Nutrition

Ten fellowships for research in clinical nutrition are being offered to medical students by the Nutrition Foundation, Inc., in cooperation with the Council on Foods and Nutrition of the American Medical Association. The fellowships are designed to stimulate a more active interest in the science of nutrition among staff members and students of schools of medicine.

Each fellowship provides \$200 monthly for the student for not more than 3 months of the nonacademic year. Grants will be awarded on the recommendation of a senior investigator, who should make written application to the Council on Foods and Nutrition, American Medical Association, 535 North Dearborn Street, Chicago 10, Ill., by December 15, 1958.

Eternal Verities

- The tubercle bacillus is still the cause of tuberculosis. The primary attack must be here and not diverted too much to secondary factors.

- The disease is still communicable from man to man and from animal to man.

- The tuberculin test is still the best means of locating tuberculous infection whether in the individual or the community.

- Tuberculosis still occurs essentially as a family epidemic, and epidemiology must start with the family unit.

- Tuberculosis is still an insidious and chronic disease; its early stages are asymptomatic. Vigilance is still necessary to detect the disease in its earliest stages.

- In spite of shortened periods of hospitalization, the disease still represents an economic drain in money and time.

- The disease is still socially disrupting in its effects on the family, on employment, and so on.

- Everybody is vulnerable regardless of age, sex, race, or social stratum.

—HERMAN KLEINMAN, M.D., *from a paper delivered at the annual meeting of the National Tuberculosis Association, Philadelphia, Pa., May 19–22, 1958.*

production, which may occur as a result of a variety of stresses or strains, can be highly significant. Maintenance of a proper balance of cortisone would be the objective, Long indicated.

Possibly affecting hormonal balance but perhaps operating in some other fashion, mental attitudes have been described many times as favoring or controlling the progress of tuberculosis, Long said. To some they seem to be as vital as the use or non-use of chemotherapy.

The attitudes Long mentioned included anxiety, complacency, willpower, determination, cooperativeness, hostility, care, and carelessness.

Other factors that seem to influence resistance to tuberculosis are nutrition, other diseases and even accidents, and biochemistry, according to Long.

Dr. Max B. Lurie, of the Henry Phipps Institute, emphasized the influence of the thyroid

on resistance to tuberculosis. He reported that thyroid hormones markedly suppress activity of tuberculosis in rabbits, while propylthiouracil (a thyroid depressant) and removal of the thyroid gland have the opposite effect.

Lurie also reported that production of antibodies against a nonspecific antigen (bovine serum albumin) can be "markedly enhanced" by a thyroid hormone in some rabbits.

Protective Measures

Clean air is the best safeguard against the spread of tuberculosis, advised Dr. Richard L. Riley, associate professor of environmental medicine, Johns Hopkins University, Baltimore.

Riley suggested specifically, in order of decreasing importance, "air purification by ultraviolet irradiation, ventilation with plenty of fresh air, avoidance of crowding, covering coughs and sneezes, spitting into a handkerchief, and use of masks" as protective measures in hospitals.

People catch infectious diseases when infectious material becomes implanted on types of tissue on which it can grow, not simply by touching the material, he explained. Lung tissue is extremely susceptible to the tubercle bacillus; the skin, the upper respiratory tract, and the alimentary tract are much less so.

Hence, it is the small droplets, so tiny that they can be seen only in photography taken with special illumination, that are the culprits, according to Riley. These droplets, produced in large numbers by coughing, sneezing, spitting, laughing, and talking, evaporate in a fraction of a second, leaving dried residues called droplet nuclei. The droplet nuclei are small enough to float about on air currents and can be inhaled deep into the lungs where they are deposited.

Animal studies that have shown promising results with a tuberculosis vaccine were reported by Dr. H. Stuart Willis, of Chapel Hill, N. C. He said that a vaccine made from an attenuated strain of tubercle bacilli known as R₁R_v had offered more protection to guinea pigs than BCG vaccine. Co-authors of the paper were H. M. Vandivere and Margaret R. Vandivere, also of Chapel Hill.

tomyacin, para-aminosalicylic acid (PAS), and isoniazid. Usually two of the drugs are given the patient, but in some cases isoniazid is given alone.

★ Because none of these drugs kills all the tubercle bacilli, because of the phenomenon of drug resistance, and because some patients do not respond to treatment with these three drugs, one of the great needs in tuberculosis therapy is for improved medication.

★ Among the drugs of limited usefulness are pyrazinamide, viomycin, and cycloserine. A new drug is kanamycin.

★ The use of drugs to keep infection under control and the development of new surgical techniques have made it safer to remove diseased areas of the lung which might become foci of new infections.

★ Drugs have also been the key factor in the current trend of treating tuberculosis in medical centers rather than in remote sanatoriums. Since drugs bring infection under control at an earlier date than was formerly possible, the danger of spread of disease by patients under treatment has been lessened. The danger of spread of disease by the unknown, untreated case is as great as ever. Tuberculosis is spread primarily by patients with active disease who cough up tubercle bacilli.

★ The tuberculin skin test and the chest X-ray are the principal instruments for finding tuberculosis. The tuberculin test does not reveal active disease, but it does reveal infection by tubercle bacilli. It is a sensitive index of the danger spots in the community.

★ If a person reacts to a tuberculin test, a chest X-ray is advocated. The chest X-ray is also indispensable to the physician in following the course of the disease, and it may also be used as the primary casefinding technique in many circumstances among adult population groups.

★ A serologic test which may prove valuable in the diagnosis of active disease has recently been developed by scientists at Northwestern University School of Medicine, and is now under extensive study.

★ BCG vaccination for certain groups of the population who are more than normally exposed to tuberculosis is advocated by the American Trudeau Society. It is given only to

persons who are tuberculin negative. Thus the persons in greatest need of protection—the tuberculin positive, among whom most of the tuberculosis occurs today—are ineligible for vaccination with BCG.

★ Studies are underway to determine the possible value of isoniazid as a prophylaxis.

★ A vaccine which could be given to the entire population and which would not destroy the value of the tuberculin test (as does BCG) is among the great needs in the tuberculosis eradication program. Among the other questions for research are how tuberculosis drugs work, how the function of the lung can be preserved despite disease, and a better understanding of the tubercle bacillus itself.

Natural Resistance and Therapy

The popular belief of Hippocrates' day that tall, fair men are more susceptible to tuberculosis than short, dark men may not be so wrong as modern-day scoffers would have us believe, according to Dr. Esmund R. Long of Pedlar Mills, Va., in the Amberson Lecture. Dr. Long is emeritus professor of pathology, University of Pennsylvania, and was formerly director of medical research for the National Tuberculosis Association and director of the Henry Phipps Institute.

Discussing the supporting structure of immunity in the therapy of tuberculosis, Long pointed out that recent studies on military personnel appear to bear out the ancient concept.

"The unexpressed thought seems to be that the characteristics named are genetically linked with other factors that are truly pertinent to native resistance," he said. Among these factors are hormones.

It has long been recognized, Long observed, that people with insulin deficiency have low resistance to tuberculosis, while those with an excess of thyroid hormone are not prone to the development of the disease.

As for the steroid hormones of the adrenal glands, cortisone, in suppressing inflammation, may be beneficial in some forms of tuberculosis, particularly meningitis, and detrimental in others. The important point, Long explained, is that cortisone does modify resistance; therefore, physiological differences in the body's

operated upon either before they became pregnant or during their pregnancy. The operations included removal of a lobe of the lung, removal of a segment of a lobe, and collapse of the lung by a thoracoplasty.

In all instances antimicrobial drugs were given the mother without harm to the child, said Schaefer, but in no instance was the mother permitted to nurse her baby.

Chicago surgeons T. W. Shields, W. M. Lees, and R. T. Fox reported a followup study of 101 persons who had had a lung removed between 1951 and 1955 because of tuberculosis. They found that 11 of the patients died within 60 days of the operation and another 5 died within a year as the result of complications. Nonfatal complications occurred in 18 patients. The majority of the patients, 57, had uneventful postoperative courses.

For patients who have difficulty in breathing because of chronic lung disease, a "window" that will open and close can be carved in the windpipe. Construction and operation of the window were described by Dr. Edward Ernest Rockey, clinical instructor in surgery, New York Medical College, New York City.

The window is cut in the front wall of the trachea and can be reached from the outside through a skin tunnel. The tunnel is entered between two doorlike skin valves located over the front of the neck.

The procedure, used mainly on patients with emphysema, permits access to the tracheobronchial tree so that secretions can be aspirated and medication applied by the patients, according to Rockey. Of the 6 on whom it has been tried, 2 have improved sufficiently to leave the hospital for the first time in years.

Co-authors of the report were Dr. Samuel A. Thompson, New York Medical College; Dr. Charles F. Blazsik, St. Anthony's Hospital, Woodhaven, N. Y.; Dr. Edgar Mayer, New York University Postgraduate Medical Center; and Dr. Israel Rappaport, Columbia University College of Physicians and Surgeons.

Mimics of Tuberculosis

A disease caused by "atypical" mycobacteria that mimic the tubercle bacillus but are distinct from it has been reported among 100 pa-

tients in Florida hospitals. The disease in these patients was discussed by Dr. Albert G. Lewis, Jr., Frank P. Dunbar, Dr. Eunice M. Lasche, and Dr. Ernest N. Lerner, of Tampa; Dr. Robert J. Davies, of Tallahassee; and Dr. Dwight J. Wharton and Dr. James O. Bond, of Jacksonville.

All the patients had chronic pulmonary disease, but the organisms recovered from their sputum had characteristics different from the tubercle bacillus. The bacilli were grouped as photochromogens (yellowish when exposed to light); nonphotochromogens (without color); scotochromogens (yellowish in the dark); and unclassified.

Most of the atypical organisms were resistant to isoniazid and PAS and were partially resistant to streptomycin, according to the Florida report. Treatment was highly effective in patients from whom photochromogens and scotochromogens were recovered, but not so effective among those infected with nonphotochromogens.

"Clinically, radiologically, and pathologically," the report stated, "the cases are indistinguishable from tuberculosis."

Sarcoidosis, another mimic of tuberculosis, was the subject of a symposium. A mimic also of cancer, this lung disease is of unknown origin. The highest prevalence, according to Dr. John S. Chapman, professor of medicine, Southwestern Medical School, University of Texas, is in the southeast. Also, it is found more frequently among Negroes than among whites and is rare in the Chinese and in American Indians, he stated.

Although the steroids—prednisone and prednisolone—do not cure sarcoidosis, they have a suppressive action that may be beneficial "in selected instances where the unremitting course of the disease is producing loss of organ function or is even life threatening," stated Dr. Louis E. Siltzbach, Dr. Mark M. Imberman, and Dr. Howard Grossman, of Mount Sinai Hospital, New York City.

Other Chest Diseases

A negative association between physical activity and coronary artery disease at a young age was suggested in a report by Dr. David M.

Animal experiments have also indicated that a limited degree of immunity to tuberculosis can be transferred by cells from vaccinated animals. These experiments were discussed by Dr. Emanuel Suter, University of Florida College of Medicine.

When monocyte cells from immunized animals were infected with tubercle bacilli, the multiplication of the organisms within the cells was restricted, Suter said, and, furthermore, protection was given mice injected with cells from immunized animals.

These results, Suter declared, show that washed cells from vaccinated animals can induce a limited degree of infection immunity. The limited protection suggests that a complex mechanism is responsible for acquired resistance in tuberculosis. Experiments by others using serum from vaccinated animals point in the same direction, he added.

Drug Therapy and Hospitalization

Development of resistance to kanamycin was reported by Dr. Kenneth Wright, Onondaga Sanatorium, and Dr. Attilio Renzetti, Joseph Lunz, and Dr. Paul Bunn, department of medicine, State University of New York, Syracuse. This drug, made from a mold akin to that from which streptomycin and neomycin are derived, was discovered in Japan by Dr. Hamao Umezawa of Tokyo University.

Reporting on use of the drug with 12 patients who had not improved under other drug therapy, Wright said that by the end of 90 days the tubercle bacilli of all patients had become resistant to the drug, although there was X-ray and symptomatic evidence of improvement in 4 patients. The resistance, he added, was about the same as that observed with streptomycin when this drug was used alone.

Whether the use of another drug with kanamycin will delay development of resistance has not been determined, Wright said. He believes that further study with the drug is indicated.

A combination of cycloserine and viomycin may prove beneficial to patients who do not respond to isoniazid, streptomycin, and PAS, according to Dr. William S. Schwartz and Dr. Ralph E. Moyer, of the Veterans Administration Hospital, Oteen, N. C. Experience with

57 patients with moderately or far advanced disease who had failed to respond to other drugs indicates that the regimen may be the most promising "secondary regimen" so far tried.

A simple method of keeping track of how the individual patient is responding to isoniazid was described by Capt. Robert L. Taylor, Fitzsimons Army Hospital, Denver. Such a procedure is needed because patients vary in the way they metabolize the drug. Some break it down chemically and others excrete it without change. The latter derive the greater benefit.

For the rapid metabolizers, it may be practical to give larger doses than usual, Taylor said. After the patient's use of the drug is determined by a bioassay technique, the blood levels of isoniazid in the patient as the dosage is increased can be determined by simple chemical analysis, according to Taylor.

Despite the wonders of antibiotic and chemical therapy, "treatment of new cases of tuberculosis is best begun in the hospital," asserted Dr. Frances S. Lausdown, Dr. Julia Jones, and Fannie Behlen, of Bellevue Hospital, New York City. Their conclusion was based on a survey of more than 600 patients who had received care through the outpatient clinic of Bellevue, most beginning treatment in the hospital.

Initial treatment in the hospital facilitates complete clinical evaluation, allows careful observation during early periods of therapy when drug reactions most frequently occur, and minimizes the dangers of infection of associates in the home, they said.

Concerning the danger of infecting others, it was found that 42 patients discharged tubercle bacilli longer than 4 weeks, while the rest either had positive sputum for only a brief period or were sputum negative throughout the course of treatment outside the hospital.

Surgical Treatment

Major surgery for tuberculosis, even removal of an entire lung, does not prevent safe childbirth, according to an obstetrician, Dr. George Schaefer, of Cornell University Medical College. He reported on the safe delivery of 32 babies to 29 tuberculosis patients who had been

Health Departments and Prevention of Motor Vehicle Accidents

ALBERT P. ISKRANT, M.A.

THE MOTOR VEHICLE is the chief cause of accidental death in every age group from 1 to 65 years and outranks any other cause of death in the age group 5 to 30.

Motor vehicle accidents annually kill approximately 40,000 persons, injure approximately 5 million, and cause the loss of 100 million man-days. These accidents injure 1 out of every 10 males between the ages of 15 and 24 and cause 40 percent of all deaths of males in that age group. In the group aged 15-24 years, the proportion of motor vehicle deaths in relation to all deaths has risen phenomenally. Pronounced but less drastic increases are seen in the groups 5-14 and 25-34 years old (fig. 1).

The pattern of nonfatal injuries caused by motor vehicles is similar to the pattern of deaths, being highest in the age group 15-24 years. The estimated number of nonfatal injuries in the United States for the period July-December 1957 is shown in table 1, and the estimated annual injury rate for motor vehicle accidents, in table 2.

On the basis of the mortality and injury data available, motor vehicle accidents would certainly appear to qualify as a public health problem, which it is believed is amenable to the epidemiological approach used in other public health problems. Because of their knowledge of epidemiological procedures and

other programs health departments can contribute to the solution of this health problem in a number of ways.

Epidemiological Approach

The epidemiological approach consists of finding out the who, how, where, and when of accidental injuries and deaths, and, if possible, the why. It includes five steps: collection and analysis of data, examination of apparent relationships, establishment and testing of hypotheses, development and testing of control measures, and incorporation of tested measures into prevention programs.

At present there is not to my knowledge any full-scale epidemiological study of motor vehicle accidents being carried out in the United States. One is planned by the traffic institute of Northwestern University, using an interdisciplinary team consisting of a physician, an engineer, and a social scientist, and an epidemiological study of the automobile accidents of adolescent drivers is planned for joint execution by the Harvard Medical School and the Harvard School of Public Health. Several completed studies have been referred to as epidemiological, but these are concerned solely with the host or with human factors.

Host and Human Factors

As with most of the diseases, the mortality rate for motor vehicle accidents is higher for males than for females. The chief toll is among young males in the prime of life, although one-fifth of the deaths from motor vehicle accidents

Mr. Iskrant is chief, Operational Research, Accident Prevention Program, Division of Special Health Services, Public Health Service. This paper was presented at the 24th New England Health Institute, University of Connecticut, Storrs, June 20, 1958.

Spain, a pathologist at Beth-El Hospital, Brooklyn, and Dr. Victoria A. Bradess, medical examiner of Westchester County, N. Y.

The apparent reason is that "activity promotes the development of collateral circulation," they indicated. In other words, the blood vessels of the active man are in a condition, because of exercise, to take over a major role in the circulatory system.

The report was based on a postmortem study of 1,500 sudden deaths in Westchester County during an 8-year period. Deaths from coronary occlusion were classified according to occupation, regardless of economic status. The data, Spain and Bradess specified, showed that the men in sedentary positions had died at a younger age than the men who led a more active life.

To determine whether this might mean that there had been an increase in coronary artery disease or that more inactive than active people had atherosclerosis and thrombosis, they analyzed data on the amount of atherosclerosis among men of comparable age groups who had died suddenly from accidents. They found no significant difference in the amount of coronary atherosclerosis in the various age groups in relation to differences in occupational physical activity.

In another paper, pathologists from several cities reported a new lung disease. Characterized by a stoppage of the alveoli with a protein-like material rich in fats, the disease has been tentatively designated "alveolar proteinosis," according to Dr. Samuel H. Rosen, of the Veterans Administration, assigned to the Armed Forces Institute of Pathology, Washington, D. C.

Co-authors were Dr. Benjamin Castleman, of Massachusetts General Hospital, Boston; Dr. Averill A. Liebow, of Yale University Medical School; Dr. Frank M. Enzinger, also of the Armed Forces Institute of Pathology; and Dr. Richard Thomas N. Hunt, of Massachusetts General Hospital.

Diagnosis was based on biopsy material or autopsy specimens from 25 patients from all sections of this country and (one each) from

Canada, England, and Italy. Although the first case was observed at Massachusetts General Hospital 5 years ago, Rosen said that most of the cases have been seen within the past 3 years.

There have been 8 deaths. In 3 of the patients who died, a fungus disease was superimposed on the original condition, Rosen said.

At the onset of illness, there are in some instances symptoms usually associated with pneumonia. The most common complaint is shortness of breath, usually with cough, he added.

No micro-organism has been detected that can be considered the causative agent. It is assumed that the disease is due to inhalation of a foreign substance, but the only clue, according to Rosen, is that 4 of the patients worked in lumber yards and 2 were electricians.

Treatment with antibiotics or corticosteroids does not appear to alter the course of the disease, and since the disease spreads through both lungs, surgery is not possible, said Rosen.

Lung Cancer

A method of producing cancer of the lung in animals in order to study suspected carcinogens was reported by Dr. Marvin Kuschner, director of pathology, Bellevue Hospital, New York City.

Pellets containing known carcinogens were implanted in the bronchi of rats through an opening made in the windpipe. Following implantation, Kuschner said, squamous cell tumors, the type usually found in cancer of the lung, originated in the bronchus around the pellet and extended into the neighboring lung.

Chemicals used in experiments so far have included, he said, polycyclic hydrocarbons, methylcholanthrene, dibenzanthracene, and benzpyrene. Studies are now underway to determine if lung cancer can be produced by this technique with components of tobacco tar, compounds of chromium, and ionizing radiation.

Co-authors of the paper were Dr. Sidney Laskin and Dr. Norton Nelson, department of industrial medicine, New York University.

have found that immaturity, lack of hostility restraint, lack of stability, absence of tension tolerance control, and aggressiveness are some of the personality characteristics associated with an excessive number of accidents.

Several studies are currently in progress to develop "scales" for measuring these personality traits. It is hoped that the knowledge gained can be incorporated into driver education and other safety programs. The health department can make a definite contribution to the prevention of motor vehicle accidents by promoting and assisting with driver education courses and driver improvement clinics and by helping to translate the results of research into practical education programs.

Studies are being planned and carried out on methods of changing or modifying behavior through the group approach, and otherwise. Corollary studies are needed on the relationship between attitudes and knowledge of safety laws and measures and between attitudes and behavior. Of particular importance in this regard are the studies on the attitudes and behavior of elderly people and on methods of modifying them, since elderly pedestrians have a very high death rate.

Physical and Sensory Defects

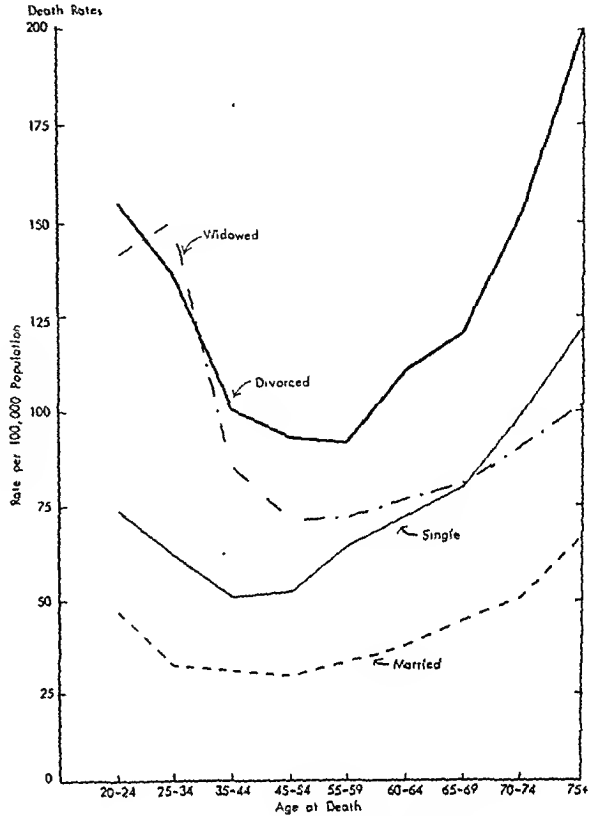
It apparently is generally agreed that organic disease, impaired functions, and aging processes increase the accident potential of persons, but the effect of these conditions on actual accident occurrence is, at present, speculative. The extent to which these persons "compensate" for their deficiencies is not known, and differences in "exposure" make comparisons difficult. One

Table 2. Estimated injury rate for motor vehicle accidents per 1,000 persons per annum, by sex and age, continental United States

| Age, in years | Both sexes | Male | Female |
|------------------|------------|------|--------|
| All ages----- | 29 | 33 | 25 |
| Under 15----- | 11 | 8 | 14 |
| 15-24----- | 72 | 100 | 47 |
| 25-44----- | 31 | 35 | 27 |
| 45-64----- | 29 | 34 | 23 |
| 65 and over----- | 29 | 26 | 32 |

SOURCE: National Health Survey data, July-December 1957.

Figure 2. Death rates from motor vehicle accidents for males, by age and marital status, 3-year average, continental United States, 1949-51.



SOURCE: National Office of Vital Statistics.

of the problems in the study of accident causation is to select groups which are exposed to constant risk and to observe them long enough to obtain meaningful data.

Employers of persons who will be exposed to high risk of accident can accept presumptive evidence of physical impairments in making their decisions concerning the hiring of applicants. Therefore, employers may accept a list of conditions which would be bars to employment as drivers of commercial vehicles, and licensing agencies may refuse to issue licenses to persons having these conditions. Refusal of permits to private drivers is, however, another question, and the evidence of the effect of a condition or defect must be more unequivocal than now exists for many of them before they can be refused licenses to drive. Studies of the effect of all types of conditions

are among pedestrians, and deaths of elderly men and children under 10 years of age contribute greatly to this number. In general, death rates are higher for nonwhite than for white persons. Exceptions are the rates for the age group 15-24, and the group over 75 years old. Married persons, especially men, have lower death rates from motor vehicle accidents than any other marital status group. Rates for divorced men are considerably higher than for other groups (fig. 2).

Health workers generally agree that further knowledge of the human factors in accident causation is needed before significant advances in highway accident reduction can be achieved. Existing knowledge on this subject has been summarized by McFarland and his co-workers (1).

The question of "accident proneness" has been explored at length, but sporadically. More than 20 years ago a review of the accident experience of approximately 30,000 drivers in Connecticut showed that a group of less than

Table 1. Estimated incidence of motor vehicle injuries, July-December 1957, continental United States

| Age, in years | Both sexes | Male | Female |
|------------------|-------------|-------------|-------------|
| All ages----- | 2, 414, 000 | 1, 346, 000 | 1, 097, 000 |
| Under 15----- | 281, 000 | 104, 000 | 175, 000 |
| 15-24----- | 748, 000 | 482, 000 | 265, 000 |
| 25-44----- | 710, 000 | 387, 000 | 323, 000 |
| 45-64----- | 491, 000 | 284, 000 | 207, 000 |
| 65 and over----- | 209, 000 | 85, 000 | 124, 000 |

NOTE: Detailed figures may not add to totals because of rounding.

SOURCE: National Health Survey data, July-December 1957.

4 percent of the operators had 40 percent of the fatal accidents, 36 percent of the injury accidents, and 38 percent of the noninjury accidents (2). In 1938 the Wichita, Kans., police department did a study of accident repeaters. Their findings have been reported in an unpublished monograph. In the intervening 20 years the number of studies to determine the characteristics of accident-prone individuals, or accident repeaters, has been legion.

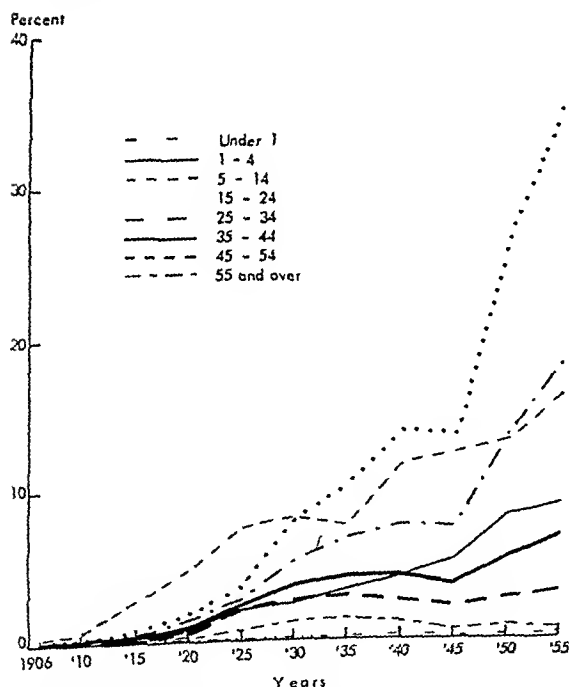
The concept of accident proneness as an innate, immutable characteristic is giving way to the opinion that, because of mutable characteristics, some people in a group sharing the same environmental risks are more "susceptible" to accidents than are others in the same group. Personal factors being investigated may be conveniently divided into behavioral and attitudinal characteristics, health and physical characteristics, and effects of temporary conditions caused by such factors as alcohol, smoking, drugs, medication, and fatigue.

Behavior and Attitudes

Studies to determine the characteristics of chronic traffic law violators and accident repeaters have been many and varied, both in the armed services and in civilian groups. While gross relationships appear, many of the findings are conflicting. Moreover, application of the findings to control programs is difficult.

A study based on findings in the armed services is underway in Denver, where tests are being administered to high school children in an effort to find the factors which "discriminate" between safe and unsafe drivers. Researchers

Figure 1. Deaths from motor vehicle accidents as percentage of deaths from all causes, by age groups, United States, 1906-55.



SOURCE: Basic data from National Office of Vital Statistics.

laria death rate per 100 million mosquitoes or per square miles of swamp or the syphilis death rate per millions of spirochetes or other numerical measure of exposure.

An analysis of accidental deaths from motor vehicles, based on residence, reveals somewhat of a pattern. The 5 highest rates in 1956 were recorded for Wyoming, New Mexico, Montana, Arizona, and Idaho; the 5 lowest, for Massachusetts, Rhode Island, Connecticut, New Jersey, and New York. The "rate per miles driven" gives a somewhat different pattern and places Alabama, Louisiana, and South Carolina among the five States with the highest death rates from motor vehicle accidents. Apparently, driving is more hazardous in the south than in some other areas, although a person's chance of being killed in a motor vehicle accident are highest if he lives in the Rocky Mountain States. Based on fuel usage per capita in the United States, people in the western States drive more than those in the eastern States.

Weather is an environmental factor which obviously affects motor vehicle accidents. Because of lack of comparability of exposure data, statistics on the effect of weather, lighting, and road conditions are hard to evaluate, and the extent to which drivers compensate for obviously unsafe conditions is unknown. Statements in the newspapers, taken from gross statistics and indicating that most accidents occur on dry pavement on clear days and that the "safest time to drive" is between 2 and 4 a.m., are generalizations which have no practical value. Exposure data for rate calculations are needed in comparing the "risk" of driving under various circumstances. Fall and winter are, however, known to be the seasons of highest occurrence of accidental deaths from motor vehicles in the United States.

Surveys and Records

Data on injuries are obtained chiefly from surveys and reports from various sources. The National Health Survey is providing data from which national and regional estimates can be made. The California Health Survey provides data about accidental injuries in California. The Connecticut State Department of Health is about to undertake a family injury survey,

which should provide a wealth of information on both highway and other accidental injuries in Connecticut.

Injury reports by hospitals and physicians can provide information useful to health departments. Worcester, Mass., has an injury reporting system in operation, and in New Bedford, Mass., childhood accidents are being reported. Some such measure of the incidence of injuries is necessary for the evaluation of preventive programs, educational or otherwise.

Accident records of traffic or motor vehicle bureaus are another important and sometimes overlooked source of information to health departments. The Georgia Department of Public Health is making a study of traffic accident records to determine their usefulness in developing programs of highway safety.

The National Office of Vital Statistics has designed supplements to the death certificate which are used from time to time by some State health departments to obtain more information on motor vehicle accidents than is now available from the death certificate.

Program Evaluation

Program evaluation is a well-established procedure in all health departments. A requisite of program evaluation is a baseline of data from which to measure change. For example, if certain measures are instituted, do highway injuries and deaths decrease? Inherent in such evaluation is stability of statistics. Death statistics, of course, are comparable but may not be large enough to show meaningful trends in non-populous areas. Some type of injury measurement is necessary for determination of the results of programs of prevention of motor vehicle accidents.

Secondary Prevention

For every death on the highway more than 100 persons receive nonfatal injuries. The emergency care given an injured person is an important factor in determining whether the injury results in death, permanent disability, or recovery. The care of injured persons usually consists of first aid, transportation, and medical management of injuries. Health depart-

and impairments on accident frequency and severity are badly needed.

The accident experience of a group of persons with an impairment might be compared with the experience of a control group free from that impairment, matched by age, exposure, and whatever other variables are recognizable. A corollary study should be made on the methods of keeping records of physical condition and the details of accident causation. Because of the difficulty of selecting appropriate groups with particular defects and following their accident experience, it may be more appropriate to give complete physical examinations to a sample of drivers applying for new licenses and of older persons applying for renewals of existing licenses at a particular center. Additional tests for attitudes may also be included. By making a complete followup of drivers who are examined and selecting an appropriate control group without the defect or impairment of these drivers, the same series of observations could be used for testing various hypotheses.

Effect of Temporary Conditions

Temporary states and conditions which cause a reduction in mental awareness or diminished reflexes obviously result in an increased liability to accidents. Unquestionably, persons who are under the influence of alcoholic beverages are more likely to have accidents than those who are not, but what is the effect of low levels of alcohol present in the blood some time after drinking?

The effect of smoking on drivers of automobiles is not clear, especially when smoking is combined with carbon monoxide and with high altitudes. The effects of various drugs on human efficiency are also not entirely known, either as to undesirable side effects or induced mood changes.

When automobile drivers fall asleep, it is obvious that fatigue is accident inducing, but other aspects of fatigue are not as clear. More work needs to be done on so-called operational fatigue, which has been stated to be partly the result of frustration and conflict within the individual.

Needed studies of the effects of these various factors include: the effect of certain drugs on social behavior and emotions, and consequently

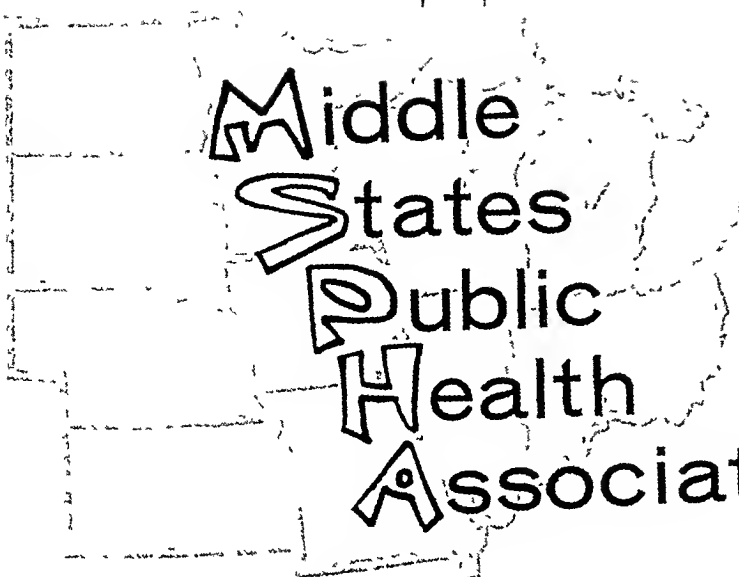
on accidents; the relationship of sleep and dozing to accident occurrence and the value of certain remedial measures; the relationship of temporary attitudes to the occurrence of accidents; the phenomenon of "road hypnosis" and factors instrumental in causing it and in reducing it; and the relationship of operator performance to levels of alcohol in the body. Many planned studies aim at determining some of these relationships. The New York State Health Department, for example, proposes a broad study of the relation of personal factors to accidents and plans to use the knowledge gained for educational and licensing purposes.

For all studies relating variables to accidents, the construction and use of an automobile simulator of high sensory and motor fidelity, which could be used to produce a variety of experimental situations under controlled conditions, would be a distinct advancement. Such a simulator would allow observation of the behavior and reaction of the driver, with a view to discovering what he does under various conditions which may lead to accidents; under what conditions he is more likely to respond poorly; the deficiencies, either in him or in his environment, that may produce such hazardous behavior, or failure to behave; and in what ways such dangerous behavior may be corrected or avoided.

Environment

When we discuss environment, we ordinarily think of geographic distribution, and because the "rate per 100,000 resident population" best expresses the extent of any health problem, this rate is customarily used in calculating geographic distribution of diseases or injuries.

Rates of motor vehicle deaths or injuries by place of occurrence of accidents, however, are usually calculated per estimated number of miles driven in an area. This rate may be appropriate for estimating the risk of accidental death while driving, but for estimating a person's chance of being killed in a motor vehicle accident, the rate per population is the appropriate one. Parenthetically, the accidental death rate is the only rate for a major cause of death which is calculated with the "agent" of exposure as the base rather than the number of people at risk. We never calculate the ma-



Middle States Public Health Association

Members from 12 States attended the ninth annual meeting of the Middle States Public Health Association, April 28-30, 1958, in Milwaukee, Wis. The following pages carry summaries of five of the papers presented at the conference.

Proposes New Category For Nonparalytic "Polio"

Minnesota's 1955-57 experience with virus diseases of the central nervous system has put epidemiologists and physicians through an exciting time, according to Dr. Herman Kleinman, chief, section of chronic diseases, Minnesota Department of Health.

The poliomyelitis surveillance unit of the State health department was established in 1955 primarily to watch, through detailed epidemiological and laboratory work, the course of poliomyelitis when the Salk vaccine was first used in Minnesota. Necessarily the unit also surveyed aseptic meningitis.

The term "aseptic meningitis" is used, Kleinman stated, to mean not a specific disease entity but a syndrome common to many entities

whose responsible agents include viruses, which primarily concern him, bacteria, and leptospirae.

Use of the Salk vaccine has made nonparalytic poliomyelitis more difficult to identify, and physicians in Minnesota are increasingly reluctant to make this diagnosis, he stated. Diagnosis has also been complicated by the demonstration that many virus agents can duplicate clinically nonparalyzing aseptic meningitis. However, diagnosis has also been clarified by the laboratory's ability to assign precisely a single virus type as the etiological agent for an increasing number of clinically similar but etiologically different disease entities. These agents, the polioviruses and the Coxsackie and ECHO viruses, come from the family of enteroviruses.

In 1955 the agent responsible for most central nervous system viral disease in Minnesota was the polio-

virus; in 1956 Coxsackie B5 virus was isolated more frequently than any type of poliovirus; and in 1957 the predominant virus was ECHO 9, Kleinman said.

The table shows Minnesota's experience with viral disease of the central nervous system for these 3 years. Kleinman pointed out that the arthropod-borne encephalitides, lymphocytic choriomeningitis, and mumps meningo-encephalitis presented no major epidemiological problems. But the remaining categories in the table, poliomyelitis, Coxsackie B5 aseptic meningitis, ECHO 9 aseptic meningitis, and aseptic meningitis of undetermined cause, were a different matter.

1955-57 Outbreaks

Although the total incidence was low, 1955 was definitely a poliomyelitis year. Poliomyelitis incidence was still lower in 1956 when

ments could well concern themselves with local methods of administering first aid.

At Cornell University, significant research is being done into the aspects of the automobile which cause or accentuate injuries. As a result of their findings, the newer cars have incorporated into their designs features such as safety locks on doors, padded dashboards, recessed steering wheels, factory installed safety belts, and the like (3).

The design of the automobile is outside the control of health departments, but other methods of preventing or minimizing injuries following accidents merit their interest. Promoting the use of safety devices, including properly installed safety belts, would seem to be a legitimate concern of health departments.

Need for Cooperation and Research

Since highway accident prevention is a concern of various community agencies, official and voluntary, cooperation between the health department and these agencies is important. A committee of representatives from these agencies might increase the contribution of epidemiological techniques, program evaluation, and other public health and medical skills to the field of highway accident prevention.

Through epidemiological research health departments can offer a challenge to physicians and others to enter and remain in the field of public health. Research "is an important key

to the grand strategy of effecting change from the traditional in public health to the newer challenges . . ." (4).

Summary

Motor vehicle accidents are amenable to the same epidemiological approach as other public health problems.

No full-scale epidemiological studies of motor vehicle accidents are now in progress, but several are planned and more are needed.

Health departments can contribute to accident prevention and traffic safety in a number of ways. Among these are promoting and assisting with driver education courses and driver improvement clinics; helping to translate the results of research into practical education; promoting systems of first aid; promoting use of safety devices, including safety belts; and cooperating with official and voluntary community agencies.

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Appointments in International Health

H. van Zile Hyde, M.D., has been appointed Assistant to the Surgeon General for International Health. Horace DeLien, M.D., succeeds him as chief of the Division of International Health, Public Health Service.

Dr. Hyde's duties include liaison with the Department of State and other governmental agencies concerned with international health. He will continue as United States representative on the Executive Board of the World Health Organization. Dr. Hyde has been chief of health activities in the Institute of Inter-American Affairs and in the Technical Cooperation Administration, chief of the Middle East Office of the United Nations Re-

lief and Rehabilitation Administration, and, for the last 5 years, chief of the Division of International Health.

Dr. DeLien has directed the health program of the International Cooperation Administration in the Philippines for the past 7 years. In the extensive reorganization of the Philippine health services, he helped establish rural health units throughout the islands, rehabilitate 61 government hospitals, and provide training for public health personnel. Before going to the Far East, Dr. DeLien was associate chief of health activities, Bureau of Indian Affairs, for 8 years.

the disease is not poliomyelitis. This is the time to try to establish a definite etiology, said Kleinman.

The health department's poliomyelitis surveillance unit was irritated with physicians' staunchness in refusing to make a diagnosis of nonparalytic poliomyelitis. Unit leaders, impatient in 1953 with physicians who refused to make such a diagnosis at the height of the poliomyelitis season, now have only admiration for the physicians' restraint. The experience has been harrowing, said Kleinman.

In 1953 and 1957 the epidemiologist was able to remove "cause undetermined" from two categories of aseptic meningitis and give the physician two new sets of references to use in his daily diagnostic routine. The epidemiologist can offer a complete picture of the signs and symptoms, indicate the relative frequency with which they occur, tell which age groups are most likely to be affected, and indicate the incubation period and the most likely mode of dissemination.

But change in the aseptic meningitides is so fast and continuous that the epidemiologist must be prepared to continue this type of work from season to season, said Kleinman. Fortunately, Minnesota had an operating poliomyelitis surveillance unit whose methods were immediately adaptable to study of the other aseptic meningitides. With it, the studies of Coxsackie B5 and ECHO 9 aseptic meningitis would have been retrospective.

Questions Raised

Kleinman listed questions raised by Minnesota's experience. Do these nonparalyzing diseases have some later effect? Dr. Albert Sabin has pointed out that serologic studies show that women of child-bearing age are particularly vulnerable to ECHO 9 infection if it is present in a community. Are pregnant women really more susceptible, as they seem to be, to poliomyelitis, and if infected, will there be any effect on the fetus? The similarity of the ECHO 9 rash and the rash of rubella makes this conjecture provocative.

What is the relative antiquity of

It is tempting to think, as Kleinman, that in past years when reports of nonparalytic poliomyelitis far outweighed reports of the paralytic disease, some of the nonparalytic cases might have been aseptic meningitis due to a then unknown cause. But divination is hazardous. Perhaps serologic epidemiology with all age groups well sampled would reveal the relative antiquity of these newly recognized viruses. This is worth trying, he suggested.

He commented on the administrative proposal that in the future, poliomyelitis be reported as such only when it is paralytic, and all nonparalytic conditions be reported under a term such as aseptic meningitis. Later the aseptic meningitis report could be qualified by designating the etiology, if it is determined. This plan would bring to the attention of health departments and epidemiologists cases which might remain unknown because present regulations do not require a report. This procedure also fits the present diagnostic temper of physicians, said Kleinman.

Rise in Reported Syphilis Preventing Neurosyphilis

The increase in the number of cases of syphilis reported in 1957 may mean fewer cases of neurosyphilis, stated Dr. Harold A. Tucker, department of clinical investigation of the Upjohn Co., Kalamazoo, Mich.

United States data for 1957 shows a peak of 135,542 cases compared with a 1955 low of 122,075. The most recent total includes 100,514 cases of late and late latent syphilis, he said.

About 25 percent of syphilitics, if untreated, develop clinical evidence of involvement of the nervous system; 5 percent will be parietic, 5 percent tabetic, and 15 percent diffuse meningovascular. Neurosyphilis is potentially even more serious than cardiovascular syphilis as a cause of mortality and partial or complete permanent disability, Tucker maintained. Therefore the 1957 case to-

tal represents an estimated 25,000 potential neurosyphilitics found and treated.

Tucker listed two factors which will tend to prevent paresis and tabes dorsalis from developing: the grace period of 12-25 years between syphilis infection and the appearance of neurological symptoms, and the success of penicillin as a brief, effective treatment for syphilis. In two recent studies of 765 patients over a 6- to 7-year period, penicillin alone appeared capable of completely curing asymptomatic syphilis of the central nervous system.

Until promiscuous sexual activity, or exposures to infected partners decrease in the Nation, we might be gratified to see annual reported totals increasing, Tucker said. This probably means that more cases are being found and treated, that contact tracing is being done well, and that serious late disease is prevented.

But no disease is ever treated out of existence, he declared. Only when promiscuity is reduced can we think that fewer reported cases reflect a reduced prevalence of central nervous system syphilis and other types of the disease.

Health Department Solves Urbanization Problems

How public health fared as Sedgwick County, Kans., doubled its population and changed its economic characteristics in less than 20 years was described by Dr. M. Leon Bauman, director, Wichita-Sedgwick County Department of Health.

The county now has 320,000 people, whose needs for adequate housing, infant and child care, and sewerage and water systems reverberated in the health department.

Overcrowded, substandard homes and 90 trailer camps at one time housed the war industry workers who flocked into the county. Old residents resented newcomers who kept cows in the backyard and threw the garbage out for the chickens.

Housing improved, Bauman explained, as tenants became home

there was a definite outbreak of aseptic meningitis due to Coxsackie B5 virus. Of the 75 cases finally accepted as Coxsackie B5 virus infection in 1956, 32 were initially reported as nonparalytic poliomyelitis, Kleinman said.

Coxsackie B5 was first suspected on purely epidemiological grounds. In August 1956, a few counties in the south central part of the State reported nonparalytic poliomyelitis with no paralytic poliomyelitis in the same area, and laboratory reports showed the isolation of cytopathogenic agents, not poliovirus, from cases in this area. "It was thus an epidemiological probability and a laboratory certainty that something besides poliomyelitis was occurring," said Kleinman.

By the end of July 1957, the great disproportion between the nonparalytic and paralytic disease of the central nervous system and the presence of a rash in a certain percentage of the cases made it certain that the new disease entity was neither poliomyelitis nor Coxsackie B5 aseptic meningitis. ECHO 9 infection was suspected and later proved, Kleinman said.

A statistical survey based on a random sample indicated that some 200,000 persons in metropolitan Hennepin and Ramsey Counties were affected through the summer of 1957.

The survey suggested a secondary attack rate of 25 to 40 percent.

There is a reporting phenomenon behind the raw data presented in the table for the category aseptic meningitis, cause undetermined, he stated. In 1955, the 47 cases now listed were originally reported as 15 cases of suspected poliomyelitis, 30 cases of nonparalytic poliomyelitis, 1 case of western equine encephalitis, and 1 case of aseptic meningitis. Poliomyelitis and encephalitis were ruled out on serologic evidence.

In 1957, physicians, mindful of the 1956 experience with Coxsackie B5 virus, reported 658 cases under such designations as aseptic meningitis, suspected nonparalytic poliomyelitis, and viral meningo-encephalitis. The 1957 column of the table shows what happened to this total as laboratory evidence accumulated. The number of cases of aseptic meningitis, cause undetermined, will be whittled down further, Kleinman said, and he predicted most of them will be classified as ECHO 9 infections. Physicians are increasingly reluctant to make a diagnosis of nonparalytic poliomyelitis, he emphasized.

Although poliomyelitis was generally distributed throughout the State in 1955, it was possible to map out six areas where cases were concentrated. In 1956 with fewer cases, localization could still be

demonstrated in three spots, he said.

The Coxsackie B5 outbreak in 1956 occurred principally in two south central counties. Kleinman interpreted this as a northward extension of what was happening in Iowa. The geographic separation of poliovirus and Coxsackie B5 virus that year was sharp, he said.

There is good reason to believe that the 1957 outbreak of ECHO 9 aseptic meningitis in Minnesota was widespread, he declared. Poliomyelitis cases that year were few and were confined to the areas of great population density.

High attack rates in 1956 for nonparalytic poliomyelitis and Coxsackie B5 aseptic meningitis among the young (0-9 years of age) point to an adult population that is relatively immune because of childhood exposure. But attack rates for ECHO 9 aseptic meningitis in 1957 are similar enough for ages 5 to 40 years to suggest that adults in the State had had no childhood exposure and that this infection, therefore, was new to the State, according to Kleinman.

Diagnostic Dilemma

"The diagnostic dilemma of the practicing physician can be profound and troublesome," he stated. The season of occurrence is no help because nonparalytic poliomyelitis, Coxsackie B5 aseptic meningitis, and ECHO 9 disease all occur at the same time of year. The age of an individual patient is no sure indicator of a particular viral cause.

The signs, symptoms, and cerebrospinal fluid findings cannot help to distinguish between Coxsackie B5 aseptic meningitis and nonparalytic poliomyelitis. ECHO 9 does have suggestive clinical characteristics such as the exanthem and severe headaches; in 42 percent of the Minnesota cases, the headache was described as exceptionally severe.

Perhaps the most important guidepost for the physician is the pattern of central nervous system disease occurring in a community. If there are a series of cases with none or a disproportionately small number showing lower motor neuron paralysis, then he may properly infer that

Cases of viral disease of the central nervous system, Minnesota, 1955-57

| Diagnosis | 1955 | 1956 | 1957 ¹ |
|---|------|------|-------------------|
| Paralytic | 207 | 67 | 30 |
| Nonpara | 288 | 82 | 24 |
| Mumps | 25 | 19 | 16 |
| Coxsackie B5 aseptic meningitis | | 75 | 21 |
| ECHO 9 aseptic meningitis | | | 174 |
| Western equine encephalitis | | 2 | |
| St. Louis encephalitis | | 3 | |
| Lymphocytic choriomeningitis | 5 | 11 | 2 |
| Aseptic meningitis, cause undetermined ² | 47 | 78 | 421 |
| Total | 572 | 337 | 688 |

¹ Data provisional.

² Includes encephalitis and meningo-encephalitis of unknown etiology.

NOTE: Table includes cases admitted to diagnostic categories on serologic, epidemiological, and clinical grounds. It does not include postinfectious encephalitis occurring after measles, rubella, and chickenpox. The laboratories of the Minnesota Department of Health and the department of bacteriology and immunology, University of Minnesota, collaborated on the virus isolations.

veloped in food-handling practices, the city passed codes enabling the health department to act more effectively. The department developed a continuing food-handlers' training course which has helped to improve food sanitation, although much still is to be done, according to Bauman. In other parts of the county, food-handling practices are controlled under the rules and regulations of the State board of health.

The health department has changed along with the county, he said. After several years of preliminary work, a joint city-county health department began operating in 1950. Since then the department has taken on 11 new programs with few additions to its staff. Fewer nurses were budgeted for and less is being paid for nursing time in 1953 than in 1951, although nursing service was increased two and a half times. Sanitation visits have increased substantially, and laboratory services went up 125 percent with no increase in staff. The department moved into a new \$750,000 health center in 1957.

Some problems are solved, said Bauman, but others, such as further coordinating the various areas of the county, are still ahead. Financial support from sources other than the governments of the county and city is increasingly necessary. This may lead to a true, countywide joint board of health, instead of the present arrangement, which makes the department's director responsible to the city manager of Wichita and to the chairman of the board of county commissioners, he predicted.

Business Methods Urged For Health Services

A more effective combination of "businesslike methods and missionary spirit" in public health was urged by Dr. Albert E. Heustis, Michigan's State health commissioner, who told health workers to "do some real soul-searching before starting out to taxpayers with new baskets of provisions labeled essential to public health protection." The public, like stockholders in a

business, expects "utmost efficiency" in government health operations, he emphasized.

Health agencies should consider seriously using persons with less training to help doctors and nurses extend available services, and should look into the possibilities of "pay-as-you-grow" health services, he said.

Michigan's summer program of painting fluoride on the teeth of children was cited as an example of a self-supporting service. Carried out by senior dental students and dental hygienists under the supervision of health departments and practicing dentists, the effort is financed by nominal fees paid by parents.

"Mutual understanding between health workers and the people can reverse some of the worst and most deplorable failures in public health today," Heustis declared.

"There should be a way to persuade people to use poliomyelitis vaccine in November, rather than mobbing doctors in June. There should be a way to warn families with dreams of a home in the suburbs that unless they use care they may end up sloshing around in their own sewage up on septic tank hill. And there should be a way to impress women with the fact that a simple examination may save them from cervical cancer. We have to work harder to develop the understanding, advice, and support of the consumer," he said.

In view of changing trends and technology, health agencies should evaluate services more frequently to make sure they are keeping on course. He contended that government services in health should be planned on the basis of function rather than along more limited lines.

"The confused patterns of political boundary lines often forestall doing a workmanlike job; these ink curtains on a map keep us from delivering businesslike health protection services . . . the time is ripe right now to give up Granny's patchwork quilt."

Community health services, he asserted, can be as dynamic as the rocket age population we serve.

Community Health Work And Changing Times

The meetings of this and of the many other public health associations in the United States could well serve as the study forums for new departures in health work, suggested Dr. John D. Porterfield, Deputy Surgeon General of the Public Health Service.

"The planning and development for these departures might well spring from the many local communities which, over the years, have made America strong. Their separate tests of widely varying ideas, applied in a number of different ways, could be presented for discussion at these annual forums, and these discussions could serve as the forcing bed for new experiments along the lines of the most successful ventures being carried out. The accolade of widespread adoption given to programs initially tried in one or a few communities and the reverberations of successful health progress on the public and the Nation might well inaugurate a new and splendid chapter in the public health movement we so gladly serve."

As Porterfield noted, "The acute communicable diseases that once taxed the fullest powers of former generations of our colleagues have diminished in lethal force and are giving way to the chronic diseases, the devastations of the damaged heart and arteries, radiological hazards, air pollution, accidents, alcoholism, mental disease, and all the other problems peculiar to our age of anxiety, tension, hope, and aspiration. As a population, we grow older and increasingly are becoming victims of the many disabilities of debilitation.

"In the last half century we have passed from pioneering individualism to a mass interdependency," said Porterfield. "No man any longer goes alone. We are interconnected, interdependent, international, interracial, intercultural—in a word, we are one. Society has become an intricate organism—a social design so complex that the slightest distortion might bring on its ruin.

owners and more and better houses were built. In 1933 State legislation, drawn up by the local health department, authorized the Sedgwick County commissioners to regulate housing, sewage disposal, food-handling methods, trailer camp sanitation, water supply, and other environmental functions in certain areas of the county.

In 1937 the city of Wichita passed a housing code, designating the health department as the enforcing agency, but no funds have been budgeted for the program and it is being handled on a complaint basis. Recently the city appointed an urban renewal board, Bauman said.

Infant Death Rate

As the county's population grew, the infant death rate rose alarmingly. Crowded housing, little understanding of sanitation and medical care among the newcomers, and overcrowded, understaffed hospital nurseries may have been reasons for this, Bauman said. The health department, the Kansas State Board of Health, and a community conference at the University of Wichita aroused public attention. Physicians, acting through the local medical society, appointed for each hospital a committee of a pediatrician and an obstetrician.

The health department supplied pertinent information on infant births, deaths, and stillbirths to each hospital's committee, and the State and local health agencies reminded hospitals of the need for improvements and better staffing in their child care facilities.

The resulting progress is indicated by the fact that 1938 and 1937 are the only 2 years in which the county's infant death rate was below that of the State as a whole.

Bauman listed two other health department projects that ensued. The agency now has charge of birth and death certificates for the county and supplies hospitals with birth, death, and stillbirth figures. Physicians now report certain premature infants to the health department so that public health nurses can visit and assist mothers to understand the special needs of these infants.

A large number of working

mothers and unsuitable housing created demands for child care, and after several incidents the State board of health drew up new regulations for licensing child care homes. The local health authority is responsible for explaining the standards and regulations and evaluating the homes' maintenance of them. Although Sedgwick County has more than 100 homes licensed to care for children, the department was able to carry out this task without enlarging its staff, Bauman said.

Sewage Disposal

Wichita and other communities in the county could not extend sewage lines as rapidly as they were needed. Because people outside the city limits were reluctant to pay for extending the sewers, a number of housing developments built their own sewage disposal systems. Wichita is now ringed with systems which will be difficult to incorporate later into a unified disposal system, he stated.

The city's sewage disposal plant, operating almost at capacity before the population boom began, soon fell behind in its operations. Much sewage bypassed the plant to flow directly into the Arkansas River. During World War II little could be done about enlarging the plant, and afterwards other projects were deemed more important, Bauman said. However, with 5 years of drought, the river receded until the only water it carried was effluent below the outfall of the Wichita sewage system.

Air pollution developed as oil refinery wastes containing considerable sulfur and acid wastes from an aircraft plant were added to the city's untreated, unoxidized sewage. In certain atmospheric conditions, a misty fog of hydrogen sulfide hung over a large area downriver. After the refinery stored its wastes, the aircraft factory turned its wastes alkaline, and the city chlorinated its wastes, there was no more hydrogen sulfide, Bauman reported.

But the State board of health called Wichita a serious polluter of the river, and after a bond issue to build additional treatment facilities was defeated, the State board refused to let any more sewer lines be

built in the city until ample treatment facilities were assured. The bond issue was resubmitted and carried, and additional facilities are being built.

Wichita had disposed of its garbage by hog feeding and private and municipal collection. Often, however, the spreading suburbs and fringe areas without effective disposal methods harbored and fed rodents and flies. In 1948 Wichita had six cases of typhus fever. The health department added to its functions rodent control throughout the county.

The department also persuaded builders to install garbage grinders in most new houses. This step and residual spraying helped to control flies. Bauman feared that the problem may return because Wichita recently stopped municipal garbage collection and returned to a contract system.

Water Supply

In 1950 few towns in the county had municipal water supplies and only Wichita chlorinated its water. After intensive work by health department sanitarians, nearly all communities now have supply systems and all chlorinate their water.

Underground water can be obtained in this part of Kansas by sinking a sandpoint 30 feet, and some 15,000 people in Wichita alone have private wells. Many are carelessly constructed, and a great number are cross-connected to the city water supply. Correcting this has been difficult because of popular protest to a city commission proposal a few years ago to license private wells. The license fee was designed to pay for evaluation and control programs and also yield additional revenue.

Wichita draws its water supply from Equus beds covering a large area 20 to 30 miles away. In dry weather, large pumps in this pool create a drawdown. Public objections to this have engaged the city in continuing court litigation. The city is now negotiating for the construction of a dam on one of the nearby rivers, which would increase its water supply.

When public health hazards de-

Opiates and Opiate Antagonists

ADVANCES in knowledge of the clinical uses of the recently discovered opiate antagonists nalorphine and levallorphan in the treatment of opiate and opioid poisoning, and the use of these drugs in the diagnosis of narcotic addiction, are reviewed in this monograph. Also discussed is the abuse of narcotic drugs, including the neurophysiological and psychological mechanisms of intoxication, pharmacogenic dependence, and relapse after cure.

Clinical Uses of Opiate Antagonists

In human subjects, nalorphine produces autonomic effects resembling those of morphine, but often it also produces hallucinatory and other mental disturbances, particularly after repeated doses or large single doses. In man, nalorphine has analgesic properties, and repeated doses do not produce addiction (physical dependence), but its "side effects" impair its clinical usefulness in the management of pain. In medical practice, nalorphine has been used primarily for resuscitation of patients poisoned by overdoses of morphine, heroin, methadone, dihydromorphinone, pantopon, levorphan, meperidine, or alphaprodine. In such cases, the most prominent narcotic antagonistic effects are those exerted on respiratory depression. In subjects addicted to morphine, methadone, heroin, and many other opiates and opioids (except possibly meperidine), nalorphine precipitates acute "abstinence syndromes" and has therefore been used clinically in the diagnosis of active addictions. Analysis of dose-effect relationships both in man and in animals suggests that nalorphine and its analogs exert their "specific" narcotic-antagonistic actions by (a) "molecular competition" and (b) "unmasking" of the processes responsible for the opiate and opioid abstinence syndromes.

Narcotic Drug Abuse

The problems of narcotic drug abuse include "euphoria," "addiction," and "habituation,"

and these are considered both from the neurophysiological and psychological viewpoints.

The distinction between "positive" and "negative" euphoria is discussed, and the latter is considered mainly from the standpoint of mechanisms involved in the production of morphine analgesia.

Neurophysiological data obtained chiefly in studies on "analgesic-test" reflexes in animals indicate that morphine exerts selective depressant actions on interneuronal activity in the spinal cord, medulla, midbrain reticular forma-



Public Health

MONOGRAPH

No. 52

The accompanying summary covers the principal findings presented in Public Health Monograph No. 52, published concurrently with this issue of Public Health Reports. The author is with the National Institute of Mental Health Addiction Research Center, National Institutes of Health, Public Health Service, Lexington, Ky.

Readers wishing the report in full may purchase copies of the monograph from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Health Service. Copies will be found also in the libraries of professional schools and of the major universities and in selected public libraries.

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Wikler, Abraham: Opiates and opiate antagonists. A review of their mechanisms of action in relation to clinical problems. Public Health Monograph No. 52 (PHS Pub. No. 589). 39 pages. U. S. Government Printing Office, Washington, D. C., 1958. Price 30 cents.

"The problems that confront us today are not one-agency problems. Aging, for instance, presents challenges that cut across many departmental lines—public health, social welfare, mental hygiene, hospitals and nursing homes, rehabilitation, and others. Similarly, the chronic diseases, though principally the responsibility of health departments, are also interdepartmental, inter-agency, interfacility responsibilities. To achieve our ends in these fields will require a harmonious coordination of planning and effort, of institutions and agencies, of citizen

groups and professional organizations, of concepts and methods."

However, Porterfield pointed out, the present era holds high promise. "In our complexity there is strength, and in our enforced oneness there is a will that could triumph. We are at least dreaming of a future in which men may be truly free of despair and disease, of hopelessness and fear. We shall have to make that future soon, if at all. We have the earliest threads of that grand design in our fingers. To weave them properly will require the great-

est exertion of our imaginations, our insight, instinct, and educated skill."

Porterfield believes that these new public health programs can be created and that the challenges of the changing times will not daunt or threaten us. We will find ways through the social wilderness to successes greater than any we now think possible, he said. He feels sure that all health workers share with him "the dynamic belief that man as a social being can achieve, within the limits of his physical universe, his own desirable destiny in health and well-being."



Sanitation

Authority to act against future danger to health—*Board of Health of the State of Maryland et al. v. Edward J. Crew*, 129 A. 2d 115 (1957).

A State statute conferred upon the Maryland State Board of Health authority to order the abandonment or to prevent the construction of a private well which is or which may become prejudicial to health, whenever a system of water supply serving the public is directly available. Appellee, dissatisfied with the available public water supply, dug a well within 60 feet of his septic tank in violation of regulations prohibiting wells within 100 feet of a source of pollution. Ordered to abandon his well by the board of health, he sued for an injunction restraining enforcement of the order, alleging that the order was unlawful, unreasonable, and deprived him of property without due process of law. The lower court in issuing a perpetual injunction held that the board not only failed to show that the well was prejudicial to health but failed to show a reasonable possibility that it might become so.

In reversing the lower court, the court of appeals held that the statute itself, which required compliance with standards designed

to protect the public health, is a proper and constitutional legislative exercise of the police power. Second, it held that at the time of the board's order, although there had previously been an interruption in service, the evidence revealed that an adequate and safe public water supply was available to appellee, a condition required by the statute before the board could issue the order. Finally, the evidence showed that although the water in the well was pure at the time of the order, contamination might and probably would occur at some later date. The court said that "protection of the public health is not required to wait until contamination is shown to exist" and held that the legislature contemplated that the board could act where its observation of conditions, in the light of scientific knowledge of probabilities that might occur in the environment, led it to believe that health might be affected. Accordingly, the order requiring abandonment of the well was declared to be neither unreasonable nor unnecessary and was upheld.

Operational Planning in Civil Defense for Environmental Health

KENNETH C. LAUSTER, M.S.P.H.E.

TECHNICAL preparations for the eventualities of a disaster are of little value without an operational plan describing the course of action to be taken in a given contingency. The operational plan says in specific terms who does what, when, and how. It is the mainspring of civil defense work.

There have been many activities in civil defense planning over the past two decades. One, the mutual aid program for waterworks, begun during World War II, is still carried on in many areas and serves a useful purpose. Following the 1955 floods in Pennsylvania, this program was the principal means for the emergency restoration of many damaged or destroyed waterworks.

Volumes have been written about the technical aspects of civil defense and natural disaster problems. These have been issued by the Federal Civil Defense Administration (since July 1, 1958, combined with the Office of Defense Mobilization to form the Office of Civil and Defense Mobilization), the Public Health Service, State and local departments of health, the Armed Forces, professional and technical associations and societies, the American National Red Cross, and the National Research Council Committee on Disaster Studies. The suggested reading list for civil defense health services includes only a small part of the avail-

able literature, yet the titles cover four typewritten single-spaced pages. There is no dearth of technical information for those desiring it.

A considerable amount of training has been undertaken by the Federal Civil Defense Administration through its Staff College and Radiological Defense School, by the Department of Agriculture, by the Department of Defense, by the Public Health Service, and by the Food and Drug Administration, although some of the PHS courses and the FDA courses were suspended on July 1, 1957. The radiological health training course, conducted for years by the Public Health Service at the Robert A. Taft Sanitary Engineering Center in Cincinnati, is continuing.

The result is a considerable reservoir throughout official health organizations of technically informed professional personnel whose services would be invaluable in disasters. However, plans to use their competencies effectively were inadequate or nonexistent. The big void was in the development of operational plans tailored to current planning assumptions which are based on enemy capabilities. These assumptions are set forth in detail in FCDA Advisory Bulletin No. 204.

The major threat is attack by thermonuclear weapons in the megaton range. There is no defense against this weapon except distance and shielding. If we had shielding or blast shelter, our plans would utilize them. But in their absence, the only protection is not to be near the weapon when it detonates. Hence, the Federal Civil Defense Administration recommended the broad policy of evacuation as the best means of saving a substantial portion

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tion, lateral posteroventral, and certain of the medial thalamic nuclei and cerebral cortex, while also exerting excitant actions at all levels and augmenting supraspinal inhibition.

Evidence acquired in studies on both man and animals indicates that one of the important psychological actions of morphine is reduction of pain-anticipatory anxiety. Other actions of morphine that may be involved in the production of euphoria are discussed with particular reference to personality factors.

The neurophysiological effects on the morphine abstinence syndrome of bilateral frontal lobotomy and physiological "transection" of the spinal cord in man (due to disease), and of decortication and spinal transection in the dog, indicate that the processes responsible for addiction operate at cellular (neuronal) levels throughout the neuraxis and appear to involve "counter-adaptations" to the depressant effects of morphine on interneuronal activity. While data obtained in frontal lobotomized patients and in monkeys subjected to bilateral frontal lobectomy, bilateral cingulumotomy, or bilateral ablation of the cingulate gyri are conflicting in some respects, it appears that although the integrity of the cerebral cortex and its connections with subcortical structures is necessary for the expression of "purposive" abstinence phenomena, the "nonpurposive" features of the morphine abstinence syndrome are integrated to a very large extent subcortically. In addition, studies on man indicate that during morphine addiction, adrenal and gonadal activities are depressed, probably through an indirect effect on the pituitary gland, and that transient "rebound" adrenal hyperactivity occurs on withdrawal of the drug.

In considering the psychological aspects of addiction, it is stressed that with the development of tolerance the "euphoric" effects of morphine become progressively attenuated, but that new sources of gratification are developed as a consequence of the progressively intensified "need" for the drug. The "rewarding" effects of morphine include the periodic relief of "craving," the sense of achievement engendered by successful pursuit of drug supplies ("hustling"), and social acceptance of the user by other addicts. Also, the suffering attendant upon abrupt and complete withdrawal of the

drug may serve some addicts as a means of expiating guilt.

The role of "conditioning" in the genesis of relapse (habituation) is discussed from both "classical" and "instrumental" theoretical viewpoints. A number of suggestive, but not conclusive, observations indicate that the opiate abstinence syndrome may become "conditioned" to regularly associated environmental stimuli. If verified, such a process could account, in part, for the motivation to relapse under certain circumstances long after the "unconditioned" morphine abstinence syndrome has subsided. Data more strongly supported by experimental evidence, obtained in rats, indicate that the recurrent reduction of abstinence distress during maintained morphine addiction can result in reinforcement of such of the organism's activities as culminated regularly in administration of the drug, and that in consequence, "drug-seeking" behavior may persist beyond the duration of the "unconditioned" abstinence syndrome.

It appears likely, therefore, that the probability of relapse is not only a function of the initial "euphoric" effects of opiates, which diminish rapidly as tolerance develops, but also of the cyclic actions of these agents in generating dependence and in relieving abstinence symptoms. These actions persist as long as the opiates are administered at sufficiently high dose levels and at sufficiently frequent intervals. The probability of relapse is also related to the extent to which the administration of these drugs is brought about by actions of the organism upon its environment. In addition, theoretical considerations suggest that "secondary reinforcers," or stimuli regularly associated with reduction of abstinence distress during maintained addiction, may serve as incentives for subsequent relapse.

Although practically nothing is known about the neurophysiological mechanisms operating in relapse, progress in that direction, as well as in the further elucidation of the psychological processes involved, may become possible with continued improvement of recently developed techniques for demonstrating in animals a "model" of this most important of all problems of drug abuse.

stances the success or failure of the operational plan becomes the success or failure of civil defense as a whole.

As control is reestablished, the flow of information and intelligence resumes, enabling the chief executive to operate in accordance with the situation. His future actions and orders are customarily expressed with reference to the operational plan, and often as modifications of it.

The entire process of meeting massive damage throughout an area depends on the soundness of the operational plan. The people's will and ability to resist, to save lives and property, to restore a community to a state approaching normal living, and ultimately to safeguard the productive capacity of the Nation, all are rooted in the practicability of the operational plan and the proficiency of its working organization.

Most of the work already done in the States under the survival planning program has been confined to the development of an organization and an operational plan at the State level and State-district level. This is essential to provide a frame of reference for lower echelons as they prepare their own plans. Without it, two or more cities may expect to use the same facilities in their civil defense plans.

To date these plans are generally sketchy, and to make them truly operational will require considerable study and revision by the people charged with the responsibility for carrying them out. It is imperative that the people assigned places in the organization be fully aware of their positions and their duties and responsibilities. They must also know to whom they are responsible, where they report, what they have to work with, and other details. These same people must be consulted in the planning so that the ultimate blueprint for action is tailored to their capabilities.

The general method of approach in most States is to assign to a staff member or members the responsibility of developing the operational plan. This is an appropriate procedure, and experience has demonstrated that an initial draft of the plan will be ready in the shortest possible time. However, unless the staff then studies the plan thoroughly, making appropriate revisions and additions, and becomes thoroughly familiar with it, the plan is worthless.

Health departments throughout the country too often are not aware of this planning and take little or no interest in it. They seem to feel that their civil defense readiness is complete if someone is assigned to prepare a plan.

Actually, at this point the essence of planning begins. For at this stage the people who are responsible at the grassroots begin to act.

Furthermore, in the event of an enemy attack, health authorities can never hope to provide much more than the nerve center of the total organization needed. But around this center the various kinds of auxiliary personnel must be assembled to accomplish the tasks of restoration.

Sanitation and Civil Defense

In all of the plans of the various States engaged in civil defense planning that I have seen, sanitary engineering and sanitation are always considered. In many instances, it is the only public health program mentioned. Why, I do not know. I like to think it is because the public recognizes sanitation as the foundation of public health work. Perhaps a lack of professional guidance has resulted in the omission of some important public health programs. Or possibly, after a study of the situation the realistic conclusion drawn, based on the limits of capabilities, is that all efforts must be concentrated on sanitation to provide maximum return for effort expended.

What are the specific responsibilities of the sanitary engineer and the sanitarian? Certainly they encompass all of the customary ones, complicated by the possible use of chemical warfare contaminants, biological warfare contaminants, and radioactivity. At the minimum, the sanitary engineer must be prepared to protect water, milk, and food supplies from all normal contaminants and those introduced overtly or covertly by the enemy.

The technical aspects of this task should not be completely overwhelming. It is clear that sanitarians and sanitary engineers must equip themselves to handle the problems associated with radioactivity in this age when the atomic energy industry is rapidly mushrooming. This capability must be developed as one more public health concern.

of the people. Application of this policy must depend upon local circumstances. The determination of whether to evacuate or not is the responsibility of the States and communities.

The threat of biological and chemical warfare agents is not being overlooked. A growing school of thought holds that, as the thermodynamic capabilities of the prime adversaries reach a stalemate, biological and chemical warfare agents are likely to take on increasing importance.

The Gap in Civil Defense

In observing the civil defense preparations being made throughout the country, it was noted that the most important phase, operational planning, was being neglected, largely because of the States' inability to finance the development of operational plans. All technical preparation is of little or no value without an operational plan which assigns functions and areas of responsibilities to the people in governmental positions. They must know the who, what, where, when, and how of their community's civil defense plans. They must know who is the boss, who takes the boss' place when he isn't there, and who replaces the substitute boss when he is not there. They must know what equipment and supplies are available and where they are to be found. They must know how to obtain transportation and how and with whom to communicate.

As the history of disasters reveals, chaos is almost inevitable when there is no operational plan to control and direct the forces attempting to give aid. The account in FCDA Technical Report 11-2 of the Arundel Park fire in Baltimore contains a typical incident. A physician residing in the neighborhood took his bag and went to the fire to help. He reported seeing confusion and elements of panic. He gave first aid, administered drugs he had with him, marked each patient with the medication and the time it was given, directed ambulances not to converge on the nearest hospital, and advised about 100 of the injured to see their own doctors. He soon ran out of supplies.

The only other sources he knew of were the first aid kits of fire wagons and ambulances. Too late he discovered that supplies were avail-

able from local druggists, and that a health center and casualty clearing station where stretchers, dressings, and antibiotics were stored was only a few blocks away.

A county health officer received no notification of the fire until he heard of it on the radio at his home in Annapolis. He rushed to the site but arrived after all casualties had been evacuated. Although he was chief of the organization planned to handle disasters, he was powerless to make the organization effective because physicians were not aware of the disaster plan.

Realizing the importance of operational plans and their lack in most areas, the FCDA launched a survival planning program some 2 years ago. This program is entirely financed by Federal funds through contracts with the States. The States hire the personnel and do the work under the terms of the contract. Some 47 States and Territories are now engaged in this activity.

The Plan's Function

The operational plan is the joint product of the area's chief executive, such as the governor or the mayor, and his staff. However, once the chief executive has approved and adopted the plan, it becomes his personal standing order and he takes complete responsibility for it. Prior to putting it into operation, the plan is subject to continual review, revision, refinement, and amendment, and all improvements in organization, training, and equipment are a part of the plan.

Destruction of communications and facilities by enemy attack will make it impossible for the chief executive to influence the actions of emergency forces for periods ranging from a few minutes to several hours or days. Therefore, control during this period may be decentralized, down to single service units of a few persons. Not until communications have been restored can the chief executive again influence action.

At this point of decentralization the operational plan is vitally necessary. As the standing order of the chief executive, it substitutes for his personal instructions until his control has been reestablished. Under these circum-

Efficacy of Chloramphenicol Therapy for Typhoid Carriers

MARY E. O'CONNOR, Dr.P.H.

THE VALUE of chloramphenicol in the treatment of typhoid fever has now been well established, but a question remains as to what effect, if any, therapy with chloramphenicol has on the prevention of the chronic typhoid carrier state.

Even before the use of the antibiotics, many attempts were made to find an agent that might be effective in eradicating the focus of typhoid bacilli in the chronic carrier. Search through the literature, to be described shortly, reveals many experiments with many different drugs and combinations of drugs, but these have been unsuccessful, or, if successful, have lacked confirmation. Some investigators reported cures, but in most instances they had reference to temporary or convalescent carriers and not to chronic typhoid carriers. This paper deals only with the chronic typhoid carrier state. Carriers are defined as persons who have not suffered from typhoid fever within the previous 12 months but discharge typhoid bacilli. They may or may not have had a clinically recognized attack of typhoid fever, but they excrete the organism over a period of at least 1 year. Chronic carriers who shed typhoid

bacilli at irregular intervals are sometimes called intermittent carriers.

In the absence of a reliable method of terminating the carrier state, particular interest centers in the possibility of preventing its development by the modern methods of treating the acute infection. The study here reported was designed in the summer of 1952 to evaluate the results obtained when cases of typhoid fever were treated with chloramphenicol. Data collected on 1,413 cases from Mississippi and Louisiana suggest that chloramphenicol has no marked effect on the prevention of the typhoid carrier state.

With the rapid reduction in the number of cases of typhoid fever, however, there is a corresponding reduction in the number of carriers. Feemster and co-workers attempted to collect figures on the number of typhoid carriers in the United States, but there was so much variation in the information available from State health departments that the tabulation was not satisfactory (1). However, figures are available for Massachusetts, with an estimated prevalence of approximately 25 per 100,000 population (2); for New York, 42 per 100,000 population (3); and for Mississippi, 228 per 100,000 population (4). Typhoid carriers still constitute a sizable and important problem.

The medical, socioeconomic, and psychological importance of the typhoid carrier problem has led many clinicians to seek medical treatments rather than cholecystectomy for the cure of typhoid carriers. Stertenbrink in 1928 reviewed the earlier German literature on this

Dr. O'Connor, with the Communicable Disease Center, Public Health Service, at the time this study was made, is now with the Division of International Health, United States Operations Mission, Addis Ababa, Ethiopia. The paper was submitted in partial fulfillment of the requirements for the degree of doctor of public health, Tulane University School of Medicine.

The same attitude can be applied to chemical warfare agents. The nerve gases are second cousins to the newer insecticides being used so widely in insect control and agriculture. Sanitarians must know how they are being utilized. We have been familiar with the biological warfare agents for years. However, the disease manifestations from various modes of dissemination may become extremely perplexing and cause much damage before they are ultimately brought under control.

How can we assume these added responsibilities when our overburdened staffs cannot discharge all the duties now placed upon them? This dilemma has always been with us. The only answer is that we must find ways of accepting these responsibilities because if we do not, someone else will assume them. And that would fractionate still further the health activities which are already too fractionated. If we provide the leadership and the coordination for those who do express an interest in these matters, we can retain in official health agencies those activities which rightly belong to them.

In attempting to envision the conditions of modern war, it is important that we think of a program based on facilities prevailing a half century ago. Initially, fallout may prevent movement in many areas. Communications will be disrupted and electric power unavailable, with a consequent lack of heat, light, refrigeration, sewage disposal, and water supply.

We must prepare to exist on our local resources, possibly for weeks. OCDM recommends that each family prepare to remain within its own home for no less than 14 days. Any immediate aid following an attack must be local in origin. No State should plan for or expect to receive any assistance from outside sources or from the Federal Government for at least 30 days following an attack. However, Federal aid will be forthcoming as soon as it is humanly possible in the circumstances.

In making operational plans for emergency action today, we must never forget the possibility that this threat will be with us for a long time. In designing, constructing, and re-

constructing sanitary facilities, we should think of reducing their vulnerability to blast effects, and of their functioning during power interruptions. Although we recognize our dependence on central sources of water and power and on central systems of sewage collection and disposal, we must consider the advisability of building into these systems the maximum degree of self-sufficiency at the lowest possible level of operations.

Achieving Readiness

Four principal survival measures are necessary to achieve a state of readiness. They are:

- The establishment of emergency lines of succession for key personnel in the organization.
- The preservation of records essential to continued functioning and emergency actions.
- The establishment of emergency locations for operations.
- The full utilization of all personnel, facilities, equipment, and supplies for emergency operations.

The first three measures are relatively simple to accomplish, but they are absolutely essential and must be part of any planning. The fourth is far more difficult.

How many civil defense organizations know what personnel, facilities, equipment, and supplies are available for emergency sanitation operations? How many have made a study of what would be needed to accomplish such a task in the kind of disaster we may encounter? After such studies, what balance was struck between what is available and what might be needed? What are the deficiencies and what action is being taken to overcome them?

These are some of the environmental health aspects of civil defense. Basic to them, and to all other civil defense activities, is operational planning. This planning must be done by those who will be responsible for putting it into action. The plan is merely a record of what has been undertaken and completed by official health agencies. The plan itself is nothing, but planning is everything.

necessitated visits to private physicians and to homes of the patients. Pertinent information was transferred to cards for tabulation. Each record was carefully analyzed and evaluated. Reported cases that were considered not to be typhoid fever were omitted from the study. The cases rejected because of insufficient evidence to diagnose them typhoid included probable instances of such diseases as brucellosis, paratyphoid fever, cancer, tuberculosis, amebiasis, pneumonia, murine typhus, histoplasmosis, and tularemia. These were proved later by bacteriological and other diagnostic examinations to be these diseases. Other cases which were undoubtedly typhoid fever were excluded because of inadequate data as to treatment or because of inadequate followup in instances of moving, inability to locate, loss of hospital records, and death. Fifty-three cases in all were rejected.

Diagnostic Criteria

The remaining 1,413 cases presented the usual clinical features of typhoid fever. Furthermore, the diagnosis was proved in more

than half of the cases by recovering *S. typhi* from the blood, feces, urine, pus, or spinal fluid. In most of the remaining cases, the diagnosis was based on serologic grounds, plus clinical symptoms and epidemiological evidence, or, in a relatively few cases, on epidemiological association with bacteriologically proved cases. The cases diagnosed on serologic evidence either demonstrated agglutinins in the blood which reached levels of diagnostic significance with anti-O titers of 1:640 and anti-H titers of 1:1280, or higher, or manifested at least a fourfold rise in agglutinin titer. Many of the cases diagnosed on serologic and epidemiological evidence were part of large outbreaks.

All reported typhoid cases were investigated by the local health departments. Specimens of blood, feces, and urine were collected as part of the routine epidemiological investigation of typhoid and suspected typhoid cases and the families of the patients. The Mississippi and Louisiana departments of health require that the cultures of at least two feces specimens and two urine specimens be negative for *S. typhi* on all reported typhoid fever cases before

Table 1. Cases of typhoid fever in Louisiana and Mississippi, 1947-52, by age, race, and sex, with rates per 100,000 population per annum for age and race

| State and age (years) | Number of investigated cases ¹ | | | | | | | | | Rate ² | | |
|-----------------------|---|--------|-------|----------|--------|-------|-------|--------|-------|-------------------|-----------|------------|
| | White | | | Nonwhite | | | Total | | | White | Non-white | Both races |
| | Male | Female | Total | Male | Female | Total | Male | Female | Total | | | |
| <i>Louisiana</i> | | | | | | | | | | | | |
| 0-4 | 27 | 29 | 56 | 37 | 29 | 66 | 64 | 58 | 122 | 4.4 | 8.8 | 6.1 |
| 5-9 | 40 | 35 | 75 | 41 | 39 | 80 | 81 | 74 | 155 | 7.2 | 13.1 | 9.4 |
| 10-19 | 71 | 54 | 125 | 60 | 59 | 119 | 131 | 113 | 244 | 7.4 | 12.0 | 9.1 |
| 20-39 | 102 | 73 | 175 | 46 | 40 | 86 | 148 | 113 | 261 | 5.1 | 5.9 | 5.4 |
| 40 and over | 50 | 31 | 81 | 25 | 22 | 47 | 75 | 53 | 128 | 2.4 | 3.1 | 2.6 |
| All ages | 290 | 222 | 512 | 209 | 189 | 398 | 499 | 411 | 910 | 4.7 | 7.5 | 5.7 |
| <i>Mississippi</i> | | | | | | | | | | | | |
| 0-4 | 12 | 16 | 28 | 24 | 20 | 44 | 36 | 36 | 72 | 3.5 | 4.9 | 4.2 |
| 5-9 | 29 | 13 | 42 | 35 | 36 | 71 | 64 | 49 | 113 | 6.0 | 9.6 | 7.9 |
| 10-19 | 36 | 27 | 63 | 46 | 36 | 82 | 82 | 63 | 145 | 5.0 | 6.7 | 5.9 |
| 20-39 | 26 | 28 | 54 | 29 | 21 | 50 | 55 | 49 | 104 | 2.6 | 3.3 | 2.9 |
| 40 and over | 34 | 16 | 50 | 12 | 7 | 19 | 46 | 23 | 69 | 2.2 | 1.2 | 1.8 |
| All ages | 137 | 100 | 237 | 146 | 120 | 266 | 283 | 220 | 503 | 3.3 | 4.5 | 3.8 |

¹ From State department of health and unreported hospital cases.

² Based on population data from 1950 census.

subject, analyzing the results achieved with the use of more than a hundred different therapeutic agents (5). He concluded that none of the methods was successful or even held promise. With the advent of the sulfonamide derivatives, new tests were devised but these likewise proved disappointing (6,7). After Bigger demonstrated the *in vitro* synergistic action of penicillin and sulfathiazole on *Salmonella typhi*, these drugs were used by several groups of workers in the treatment of chronic typhoid carriers (8). Korn and Trussell reported no cures (9). Smith and others state that sulfonamides and penicillin are ineffective in therapeutically attainable levels but that the newer antibiotic, chloramphenicol, seems more promising (10). However, numerous reports, among them Stryker (11) and Nichols (12) suggest that treatment of chronic carriers with chloramphenicol results merely in temporary cessation of the shedding of bacilli. A more recent possible exception to the usual experiences is reported by Carnes and associates who state that 6 of 7 carriers were cleared up by preparing them for drug therapy with chloramphenicol by an intensive course of typhoid immunization (13).

Materials and Methods

The study reported here was carried out over a period of 3 years, and the data were collected on cases occurring from 1947 through 1952 in Mississippi and Louisiana. The two States are comparable in many respects: As of the 1950 census, the population of Mississippi was 2,178,914 and of Louisiana, 2,683,516; both States have large rural areas; both are in the South Central region and have approximately the same incidence of typhoid fever; and the counties and parishes are well supplied with local health units. The use of chloramphenicol did not become widespread until late 1949. Therefore, while most of the typhoid fever cases in the control group occurred from 1947 to 1949, most of the treated ones occurred from 1950 to 1952.

The study population was divided into four groups according to the treatment received: those receiving no chloramphenicol and referred to as nonspecifically treated; those re-

ceiving inadequate total dosage of chloramphenicol; those receiving adequate total dosage initiated before the 15th day from onset of illness; and those receiving adequate total dosage initiated after the 15th day from onset of illness. Only those patients receiving chloramphenicol in dosages of 30 gm. and over were considered adequately treated. In 1950, the drug manufacturer revised the dosage of chloramphenicol (Chloromycetin) to an average of 30 gm. per patient to be given over a period of approximately 14 days. This was the dosage considered "adequate" in this study. Children received proportionate amounts of the drug equivalent to the adult dose on the basis of body weight.

Data were obtained from morbidity reports, hospital records, mortality reports, laboratory reports, epidemiological records in the local health departments, private physicians, pharmacists and reports of field investigations of cases. I investigated all reported cases of typhoid fever in Mississippi during 1950 to 1952 and part of 1949.

All identifying data on typhoid fever cases reported to the two State health departments during the study years 1947 through 1952 were recorded on a master list by year of report and by county or parish. These data included the hospital number and the name of the reporting physician. A list of the cases was then sent to the local health department with a request for the epidemiological record on all cases that had occurred in the county or parish during the study years. After copies were made the original records were returned to the local health departments. As the records were completed they were filed alphabetically, and were then taken to the hospitals where data from the hospital record were transferred to the study record. New records were made on those cases diagnosed by the hospitals as typhoid fever but not reported to the States. I then visited the State laboratories and obtained lists of all cultures reported positive for *S. typhi* during the study years. This information was added to the epidemiological records if it had not already been recorded.

Where information was incomplete, visits were made to the counties and parishes to obtain missing data. In many instances this

Table 3. Distribution of accepted cases of typhoid fever, by time of collection ¹ of first negative fecal specimen and by method of treatment, Louisiana and Mississippi, 1947-52 ²

| Treatment | Total | First negative specimen in week— | | | | | | | | | |
|--|-------|----------------------------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|----------------------|--------------|
| | | 1 | | 2 | | 3 | | 4-6 | | After 6 ³ | |
| | | Num- ber | Per- cent | Num- ber | Per- cent | Num- ber | Per- cent | Num- ber | Per- cent | Num- ber | Per- cent |
| <i>Louisiana</i> | | | | | | | | | | | |
| Chloramphenicol..... | 483 | 68 | 14.1 | 116 | 24.0 | 102 | 21.1 | 132 | 27.3 | 65 | 13.5 |
| >30 gm. before day 15 ⁴ | 205 | 35 | 17.2 | 65 | 31.7 | 46 | 22.4 | 38 | 18.5 | 21 | 10.2 |
| >30 gm. after day 15 ⁵ | 73 | 0 | ----- | 3 | 4.1 | 21 | 28.8 | 33 | 45.2 | 16 | 21.9 |
| <30 gm. ⁶ | 205 | 33 | 16.1 | 48 | 23.4 | 35 | 17.2 | 61 | 29.7 | 28 | 13.6 |
| Nonspecific ⁷ | 406 | 36 | 8.9 | 92 | 22.7 | 68 | 16.7 | 122 | 30.0 | 88 | 21.7 |
| <i>Mississippi</i> | | | | | | | | | | | |
| Chloramphenicol..... | 307 | 41 | 13.3 | 76 | 24.8 | 54 | 17.6 | 73 | 23.8 | 63 | 20.5 |
| >30 gm. before day 15 ⁴ | 66 | 11 | 16.6 | 21 | 31.8 | 10 | 15.2 | 10 | 15.2 | 14 | 21.2 |
| >30 gm. after day 15 ⁵ | 28 | 0 | ----- | 1 | 3.6 | 6 | 21.4 | 17 | 60.7 | 4 | 14.3 |
| <30 gm. ⁶ | 213 | 30 | 14.1 | 54 | 25.4 | 38 | 17.8 | 46 | 21.6 | 45 | 21.1 |
| Nonspecific ⁷ | 184 | 18 | 9.8 | 31 | 16.9 | 22 | 11.9 | 56 | 30.4 | 57 | 31.0 |
| <i>Both States</i> | | | | | | | | | | | |
| Chloramphenicol..... | 790 | 109 | 13.8 | 192 | 24.3 | 156 | 19.7 | 205 | 26.0 | 128 | 16.2 |
| >30 gm. before day 15 ⁴ | 271 | 46 | 17.0 | 86 | 31.7 | 56 | 20.7 | 48 | 17.7 | 35 | 12.9 |
| >30 gm. after day 15 ⁵ | 101 | 0 | ----- | 4 | 4.0 | 27 | 26.7 | 50 | 49.5 | 20 | 19.8 |
| <30 gm. ⁶ | 418 | 63 | 15.0 | 102 | 24.4 | 73 | 17.5 | 107 | 25.6 | 73 | 17.5 |
| Nonspecific ⁷ | 590 | 54 | 9.1 | 123 | 20.8 | 90 | 15.3 | 178 | 30.2 | 145 | 24.6 |

¹ Week after onset.

² Includes all cases from which stool specimens were obtained, whether or not bacilli were found in any specimen. "First negative" means first negative specimen after which no positive specimens were obtained.

³ Includes permanent carriers and persons who remained as temporary carriers for periods ranging up to 8 months.

⁴ Total dose with course begun before 15th day of disease.

⁵ Total dose but course initiated on or after 15th day of disease.

⁶ Inadequate total dose without regard to time of initiation of treatment.

⁷ Includes penicillin, sulfonamides, streptomycin, fever pills, and aspirin.

The ratios of male patients to female patients were 1.2:1 in Louisiana and 1.3:1 in Mississippi. Gross attack rates were higher in Louisiana than in Mississippi.

In table 2 the 1,413 cases are distributed by type of treatment and by the criteria upon which the diagnosis was based. Eight hundred and thirty-seven, or 59.2 percent, were diagnosed by isolation of *S. typhi*. Of these, 310, or 37.0 percent, had positive blood cultures; 297, or 35.5 percent, had positive fecal cultures; and 230, or 27.5 percent, were positive for *S. typhi* in both blood and feces. Five hundred and five, or 35.8 percent, were diagnosed on serologic evidence, and only 71, or 5.0 percent were diagnosed on the basis of epidemiological association. A greater percentage of positive

specimens were found among nonspecifically treated persons than among chloramphenicol-treated persons (64.2 vs. 55.4), whereas the reverse was true for serologic evidence (30.6 vs. 39.7). The percentages of epidemiological diagnoses were nearly identical (5.2 and 4.9). These differences are similar for each State although Mississippi had 5.2 percent more patients diagnosed by positive culture, slightly fewer diagnosed on serologic evidence, and twice the percentage diagnosed on epidemiological evidence.

Tables 3 and 4 show the relation between treatment and the percentage distribution of cases according to the week after onset in which was collected the first fecal specimen negative for *S. typhi* and not followed by a positive

patients are released from isolation and public health supervision. Sheppard-Keidel vacuum bleeding tubes were used to take blood for culture and serology, and standard 10-dram, screwcapped glass bottles containing a preservative were provided for feces and urine specimens. With few exceptions all culture work was done by either the laboratories of the State health departments or in Louisiana by the Charity Hospitals. Materials and methods used for culture and serology in the major laboratories were of approved types and were not changed importantly during the 6 years of the study.

Additional Followup

As part of the followup, a series of feces and urine specimens were obtained during 1953 on all patients whose cultures had been found positive for *S. typhi* intermittently for 2 months or longer during or after convalescence. This followup also included those cases which had not been reported to the State health departments by the hospitals and any cases which in the opinion of the writer, had not been ade-

quately investigated. All told, approximately 780 cases were re-investigated in this manner. As a result of this followup four persons who previously had been discharged following chemotherapy and two negative feces and urine cultures were confirmed as chronic typhoid carriers. By investigating some of the sources of these reopened cases, other chronic carriers were found and were placed under public health supervision. A considerable amount of the "shoe-leather" epidemiology was done by the public health nurses. I also visited and obtained specimens on numerous cases in the study.

Results

Table 1 shows the distribution of all study cases of typhoid fever in Louisiana and Mississippi by age, race, and sex. The table also presents the rates per 100,000 population for the 6-year period 1947 to 1952. In both States the highest rates were found in the groups aged 5-9 and 10-19 years, with those 40 and over showing the lowest rates. The rates were higher among the nonwhites in all age groups.

Table 2. Distribution of typhoid fever cases in Louisiana and Mississippi, 1947-52, by diagnostic criteria and by type of treatment

| Treatment | Total cases | Diagnostic criteria | | | | | | | | | | | |
|--------------------------------|-------------|---------------------------------|----------|--------|----------|-----------------|----------|--------|----------|---------------------------------|----------|--|----------|
| | | Salmonella typhi cultured from— | | | | | | | | Serologic evidence ¹ | | Epidemiological association ² | |
| | | Blood | | Feces | | Blood and feces | | Total | | | | | |
| | | Number | Per cent | Number | Per cent | Number | Per cent | Number | Per cent | Number | Per cent | Number | Per cent |
| Louisiana..... | 910 | 165 | 18.1 | 208 | 22.9 | 149 | 16.4 | 522 | 57.4 | 354 | 38.9 | 34 | 3.7 |
| Chloramphenicol..... | 486 | 111 | 22.8 | 79 | 16.3 | 63 | 13.0 | 253 | 52.1 | 214 | 44.0 | 19 | 3.9 |
| Nonspecific ³ | 424 | 54 | 12.7 | 129 | 30.4 | 86 | 20.3 | 269 | 63.4 | 140 | 33.0 | 15 | 3.5 |
| Mississippi..... | 503 | 145 | 28.8 | 89 | 17.7 | 81 | 16.1 | 315 | 62.6 | 151 | 30.0 | 37 | 7.4 |
| Chloramphenicol..... | 313 | 107 | 34.2 | 46 | 14.7 | 37 | 11.8 | 190 | 60.7 | 103 | 32.9 | 20 | 6.4 |
| Nonspecific ³ | 190 | 38 | 20.0 | 43 | 22.6 | 44 | 23.2 | 125 | 65.8 | 48 | 25.3 | 17 | 8.9 |
| Both States..... | 1,413 | 310 | 21.9 | 297 | 21.0 | 230 | 16.3 | 837 | 59.2 | 505 | 35.8 | 71 | 5.0 |
| Chloramphenicol..... | 799 | 218 | 27.3 | 125 | 15.6 | 100 | 12.5 | 443 | 55.4 | 317 | 39.7 | 39 | 4.9 |
| Nonspecific ³ | 614 | 92 | 15.0 | 172 | 28.0 | 130 | 21.2 | 394 | 64.2 | 188 | 30.6 | 32 | 5.2 |

¹ Fourfold rise in titer or higher titer positive on single specimen plus epidemiological association with bacteriologically proved cases.

² Laboratory diagnosis incomplete but associated with proved cases.

³ Includes penicillin, sulfonamides, streptomycin, fever pills, and aspirin.

patients (8 in an overall total of 799, or 1.0 percent) than among those given no specific treatment (12 out of 614, or 2.0 percent), the difference in rates is not significant. Thus, while the data are compatible with the idea that specific treatment reduces the carrier rate somewhat, they clearly do not prove it.

Table 6 presents the relation of intensity of specific treatment to relapse and death. It is interesting to note that when adequate dosage of chloramphenicol was given early, before the 15th day, the rate of relapse was 5.2 percent, practically the same as for the series with no specific treatment, 5.8 percent. In contrast, the group who had adequate treatment after the 15th day had a relapse rate of 21.5 percent, approximately the same as for the group who had inadequate treatment (21.9 percent). Those adequately treated before the 15th day had the lowest case fatality rate, 1.9 percent, whereas the group given no specific treatment had the highest rate, 8.1 percent. The rates for the series given adequate treatment but after the fifteenth day and for that series given

inadequate treatment were essentially the same, 5.0 percent and 5.1 percent respectively.

Discussion

A field study of the type described has some obvious limitations as a method of studying the efficacy of chemotherapeutic agents. Many of the epidemiological record forms used were not really adequate for collecting and recording data pertinent to such a study. For instance, these forms had no specific blocks for recording treatment, name of hospital, admission and discharge dates, clinic or dispensary number, or name of county. The spaces allotted to the environmental history and laboratory data were very inadequate. It would have helped considerably in differential diagnosis to have had a checklist for clinical history, physical findings and course of treatment, with space for history of onset of illness and sequelae. Since adequate supervision cannot be given by the local health departments to patients with communicable diseases who are not hospital-

Table 5. Relation of age, sex, and treatment to the development of the carrier state following typhoid fever in Louisiana and Mississippi, 1947-52

| Treatment and age group (years) | Typhoid cases | | | Typhoid carriers ¹ | | | | | |
|--|---------------|--------|-------|-------------------------------|---------|--------|---------|--------|---------|
| | Male | Female | Total | Male | | Female | | Total | |
| | | | | Number | Percent | Number | Percent | Number | Percent |
| Chloramphenicol..... | 442 | 357 | 799 | 7 | 1.6 | 1 | 0.3 | 8 | 1.0 |
| >30 gm. before day 15 ² | 163 | 109 | 272 | 3 | 1.8 | 1 | .9 | 4 | 1.5 |
| 0-19..... | 85 | 67 | 152 | 1 | 1.2 | 0 | ----- | 1 | .7 |
| 20-39..... | 48 | 28 | 76 | 1 | 2.1 | 0 | ----- | 1 | 1.3 |
| 40 and over..... | 30 | 14 | 44 | 1 | 3.3 | 1 | 7.1 | 2 | 4.5 |
| >30 gm. after day 15 ³ | 55 | 47 | 102 | 0 | ----- | 0 | ----- | 0 | ----- |
| 0-19..... | 23 | 21 | 44 | ----- | ----- | ----- | ----- | ----- | ----- |
| 20-39..... | 20 | 15 | 35 | ----- | ----- | ----- | ----- | ----- | ----- |
| 40 and over..... | 12 | 11 | 23 | ----- | ----- | ----- | ----- | ----- | ----- |
| <30 gm. ⁴ | 224 | 201 | 425 | 4 | 1.8 | 0 | ----- | 4 | .9 |
| 0-19..... | 149 | 134 | 283 | 2 | 1.3 | 0 | ----- | 2 | .7 |
| 20-39..... | 45 | 50 | 95 | ----- | ----- | ----- | ----- | ----- | ----- |
| 40 and over..... | 30 | 17 | 47 | 2 | 6.7 | 0 | ----- | 2 | 4.3 |
| Nonspecific ⁵ | 340 | 274 | 614 | 5 | 1.5 | 7 | 2.6 | 12 | 2.0 |
| 0-19..... | 201 | 171 | 372 | 2 | 1.0 | 1 | .6 | 3 | .8 |
| 20-39..... | 89 | 68 | 157 | 3 | 3.4 | 3 | 4.4 | 6 | 3.8 |
| 40 and over..... | 50 | 35 | 85 | 0 | ----- | 3 | 8.6 | 3 | 3.5 |

¹ Persons found to be shedding typhoid bacilli 1 year or longer after onset of illness; deaths not deleted because they had no more than 0.1 percent influence.

² Total dose with course begun before 15th day of disease.

³ Total dose but course initiated on or after 15th day of disease.

⁴ Inadequate total dose without regard to time of initiation of treatment.

⁵ Includes penicillin, sulfonamides, streptomycin, fever pills, and aspirin.

Table 4. Cumulative percentage distribution of accepted cases of typhoid fever, by time of collection¹ of first negative fecal specimen and by method of treatment, Louisiana and Mississippi, 1947-52²

| Treatment | Cumulative percentage of cases with first negative specimen in week— | | | | |
|--|--|------|------|------|----------------------|
| | 1 | 2 | 3 | 4-6 | After 6 ³ |
| <i>Louisiana</i> | | | | | |
| Chloramphenicol..... | 14.1 | 38.1 | 59.2 | 86.5 | 100 |
| >30 gm. before day 15 ⁴ | 17.2 | 48.9 | 71.3 | 89.8 | 100 |
| >30 gm. after day 15 ⁵ | | 4.1 | 32.9 | 78.1 | 100 |
| <30 gm. ⁶ | 16.1 | 39.5 | 56.7 | 86.4 | 100 |
| Nonspecific ⁷ | 8.9 | 31.6 | 48.3 | 78.3 | 100 |
| <i>Mississippi</i> | | | | | |
| Chloramphenicol..... | 13.3 | 38.1 | 55.7 | 79.5 | 100 |
| >30 gm. before day 15 ⁴ | 16.6 | 48.4 | 63.6 | 78.8 | 100 |
| >30 gm. after day 15 ⁵ | | 3.6 | 25.0 | 85.7 | 100 |
| <30 gm. ⁶ | 14.1 | 39.5 | 57.3 | 78.9 | 100 |
| Nonspecific ⁷ | 9.8 | 26.7 | 38.6 | 69.0 | 100 |
| <i>Both States</i> | | | | | |
| Chloramphenicol..... | 13.8 | 38.1 | 57.8 | 83.8 | 100 |
| >30 gm. before day 15 ⁴ | 17.0 | 48.7 | 69.4 | 87.1 | 100 |
| >30 gm. after day 15 ⁵ | | 4.0 | 30.7 | 80.2 | 100 |
| <30 gm. ⁶ | 15.0 | 39.4 | 56.9 | 82.5 | 100 |
| Nonspecific ⁷ | 9.1 | 29.9 | 45.2 | 75.4 | 100 |

1-7 See table 3.

specimen. Since the separate data for the two States are closely similar, attention need be directed only to the combined data for both States. From table 3 it appears that the greatest proportion of reversions occurred during the second week for the group given early adequate treatment, whereas it occurred in the fourth to sixth week for all other groups. Progress in clearing the fecal infection is shown more clearly, perhaps, by the figures for the cumulative percentages in table 4. Excluding the group which received delayed though adequate treatment and in which few isolations were attempted during the early weeks of the disease, the proportion which had permanently reverted was greater at each interval among those given chloramphenicol than among those treated nonspecifically. The most rapid clearing, of course, was in the group treated both early and adequately. In this group nearly half (48.7 percent) became negative during the second week as compared with 29.9 percent of those given only nonspecific treatment.

Twenty chronic carriers, 10 in each State,

were found among the 1,413 cases of typhoid fever in Louisiana and Mississippi. Table 5 shows the pooled data of the two States, with distribution of cases by age and sex only. In agreement with long-standing impressions, in all treatment groups carrier rates were higher among persons 20 years old and over than among younger persons. Combining all groups and the data from both States shows that the carrier rates were 0.7 percent for 851 patients under age 20, 1.9 percent for 363 patients aged 20-39 years, and 3.5 percent for 199 patients 40 years old and older. With regard to sex, the overall differences are in opposition to the usual experience but are trivial. The 782 male patients yielded 12 carriers, or 1.5 percent, whereas the 631 female patients yielded 8 carriers, or 1.3 percent. However, in the group with the highest number of carriers, those 40 years of age and older, the expected situation prevailed, with 5.2 percent of the females becoming carriers but only 2.4 percent of the males. Finally, while there were relatively fewer carriers among the specifically treated

situation is somewhat different. That *S. typhi* was not recovered from the feces of 886 or more than four-sevenths of the entire group as a whole was very largely due to failure in many instances to collect stools for test during, or soon after, the acute phase of the illness. However, the data indicate rather clearly that treatment did exert an influence on the detected excretion of typhoid bacilli. As shown in table 2, in Louisiana positive stools were found in 142 of 486 treated patients (29.2 percent) and in 215 of 424 untreated patients (50.7 percent); in Mississippi, the figures were 83 of 313 treated (26.5 percent) and 87 of 190 untreated patients (45.8 percent). Furthermore, as shown in table 4, adequately treated cases tended to become permanently negative earlier (69.4 percent during or before the third week) than the untreated cases (only 45.2 percent by the same time). It should be emphasized, however, that treatment did not eliminate bacilli from the feces with any uniformity. In 81 cases feces were positive during therapy and in 130 after cessation of therapy.

Other factors also probably influenced the data as to fecal excretion of *S. typhi*. In uncontrolled field situations where specimens are collected at irregular intervals, it obviously is difficult to know the precise time when patients cease to excrete typhoid organisms. For purposes of tabulation, I have arbitrarily chosen the time intervals used in table 3 and have entered cases in the table as of the week of collection of the first feces or urine specimen negative for *S. typhi* not followed by a positive culture. Specimens were not submitted from all patients every week nor were they collected on the first day of the stated intervals.

In this study, an effort was made to determine the relation of the persistence of typhoid bacilli in feces to the degree and time of initiation of specified treatment. However, the frequent failure to collect stools for testing during the acute phase of typhoid fever makes it impossible to speak with assurance about the number or proportion of stools positive at any specific stage of the disease. The only definite statements that can be made are that, in any given case, stools taken on or after a certain date were negative and that by a given period after onset in a certain proportion of cases ex-

cretion of the bacilli had permanently ceased. These latter figures, obviously, are minimal since, if stools had been collected earlier or more frequently, the assigned date of cessation would have been advanced in many cases.

Of special interest in this study is the excretion of bacilli in the feces beyond 6 weeks from date of onset of typhoid fever. Of the 273 patients not declared permanently negative for *S. typhi* at the end of 6 weeks, 217, or about 16 percent of the total 1,380, were actually found to be excreting the organism at a later time (table 3). Patients determined as having ceased excretion of bacilli numbered 136 in the 6- to 8-week interval, 69 in the third month, 21 during the fourth month, 11 in the fifth month, and 16 during the next 3 months, leaving a total of 20 permanent or chronic carriers, 8 among the chloramphenicol-treated group and 12 among the group receiving non-specific treatment (table 5). Treatment, incidentally, did not appear to be an important factor in this group. The data in table 3 do suggest that in Mississippi a higher proportion of cases were found excreting the agent after the sixth week than in Louisiana. A partial explanation for this may be that, because of the recognized tendency for treated cases to relapse, it became routine in Mississippi early in 1950 before releasing any patient to obtain recheck specimens about 2 months after onset of typhoid fever.

Although not all of the factors involved in the production of a chronic typhoid carrier are known, at least some are reasonably well indicated. These include age, sex, prior gall bladder disease, and the bacterial strain. With a few specific exceptions, for example, Havens and Dehler (22), efforts to analyze large series of typhoid cases have led to the conclusion that both age and sex are important (23, 24). In general, carriers are more common among adults than among children and among women than among men. Frequency of clinically recovered patients who become chronic carriers varies between 2 and 7 percent. The pattern observed in the present series of 1,413 cases is in general agreement with the foregoing analysis. In the group aged 0-19 years, carrier rates of 0.7 to 0.8 percent were observed while in the older age groups rates ranged up to 4.5 percent.

Table 6. Relation of treatment to relapse and death following typhoid fever in Louisiana and Mississippi, 1947-52

| Treatment | Number of cases | Relapses | | Deaths | |
|--|-----------------|----------|----------|--------|----------|
| | | Number | Per cent | Number | Per cent |
| Chloramphenicol: | | | | | |
| >30 gm. before day 15 ¹ ----- | 272 | 11 | 5.2 | 5 | 1.9 |
| >30 gm. after day 15 ² ----- | 102 | 22 | 21.5 | 5 | 5.0 |
| <30 gm. ³ ----- | 425 | 93 | 21.9 | 22 | 5.1 |
| Nonspecific ⁴ ----- | 611 | 36 | 5.8 | 50 | 8.1 |

¹ Total dose, with course of treatment begun before 15th day of disease.

² Total dose, with course of treatment initiated on or after 15th day of disease.

³ Inadequate total dose regardless of time of initiation of treatment.

⁴ Includes penicillin, sulfonamides, streptomycin, fever pills, and aspirin.

ized, there is some doubt as to the accuracy of the treatment records of such patients. Fortunately, 1,067, or 75.5 percent, of the 1,413 cases under study in the 6-year period, 1947-52, in Louisiana and Mississippi, had been hospitalized. In Louisiana 20 percent more were hospitalized than in Mississippi. These percentages were 82.5 and 62.5 respectively. In both States 638, or 79.9 percent, of the treated patients and 429, or 69.9 percent, of the untreated group were hospitalized.

From table 2 it is evident that of the 1,413 cases included in the study 576, much more than a third, were diagnosed without positive cultures, either blood or fecal, and that positive blood cultures were obtained in only 540 cases, or about 38 percent, of the total. This situation merits some comment and explanation.

During the period of these investigations, I observed repeatedly that, in making a diagnosis of typhoid fever, the practice in many rural areas and in many small private hospitals is to depend only on serologic evidence and clinical symptoms. Fortunately, this applied to only a relatively small part of the study group since many establishments do not admit patients with known or suspected communicable diseases. Many of the cases of typhoid fever in this study were secondary and were picked up

by the local health departments while investigating primary or index cases.

Considering the study group as a whole, it might seem that the relative paucity of bacterial isolations, especially from the blood, could be attributed to the specific antibiotic therapy employed in more than half of the cases. Many investigators have reported that the use of chloramphenicol "sterilizes" the blood and intestinal tract very rapidly. Among these, Woodward and others reported blood sterilization but frequent persistence of the agent in feces and urine after initiation of treatment (14). Supporting these findings are observations of other investigators based on much larger numbers of cases (15, 16). On the other hand, using blood-clot cultures, Thomas and others (17) and Watson (18) report numerous isolations from patients undergoing treatment. The present data, when considered with reference to treatment status (table 2), provide no evidence that chloramphenicol influences the frequency with which positive blood cultures are obtained, as the tabulation below indicates:

| Treatment | Percent of patients with positive blood cultures | |
|--------------------------|--|-------------|
| | Louisiana | Mississippi |
| All chloramphenicol----- | 35.8 | 46.0 |
| Nonspecific----- | 33.0 | 43.2 |

Available evidence indicates that clot cultures are markedly superior to cultures made with whole blood, possibly because the influence of any bloodborne antibiotic and bactericidal serum factors is minimized (19). In spite of the general use of clot cultures, isolations of *S. typhi* from the blood in this series (540 or 56.8 percent of the 950 cases with blood culture attempted) were far less than reported by earlier workers (20, 21). As pointed out in most bacteriology texts, for example, Smith and others (10), frequency of isolations of *S. typhi* from the blood is closely related to the stage of the disease, maximum recoveries being made at the end of the first week. Thereafter, the bacteria disappear from the blood and specific antibodies increase. In this light possibly the more important factor contributing to the lower rate of recovery in this series was the common delay in obtaining the first specimen for culture and serologic tests.

With respect to positive stool cultures the

nosed by isolation of *Salmonella typhi*; 35.8 percent were diagnosed on serologic evidence; and 5.0 percent of the diagnoses were based on epidemiological association plus symptoms compatible with those of typhoid fever.

In both States the highest attack rates were found in the group aged 5-9 years and the lowest in those over 40 years old. In all age groups, the rates were higher among nonwhites and males than among whites and females.

Age and sex are apparently important in the development of the typhoid carrier state. The rate of development of the carrier state in the group under 20 years of age was 0.7 percent as compared with 2.5 percent among the group aged 20 and over, a highly significant increase. Among patients 40 years old and over, 5.2 percent of females but only 2.4 percent of males became carriers.

Although early adequate treatment with chloramphenicol appeared to hasten the termination of excretion of *S. typhi* in many cases, evidence that early treatment acted to prevent the chronic carrier state is weak. The carrier rate for all patients treated with chloramphenicol was 1.0 percent and that of the nonspecifically treated group was 2.0 percent.

The study did provide evidence that early adequate treatment was followed by few relapses and few serious complications. Also, with early adequate treatment case fatality was low (1.9 percent) as compared with that in the nonspecifically treated group (8.1 percent).

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Also, in the group over 40 years of age, 5.2 percent of females but only 2.4 percent of males became carriers. In the entire series, the carrier rate was 1.4 percent. Only in one instance was there a history of prior gall bladder disease although 3 of the 20 carriers recognized in this study later had cholecystectomies. Collins and Finland considered the possibility that strain differences may account for the variations in response to treatment with chloramphenicol (25). The belief that only infections with certain phage types result in the chronic carrier state has not been justified by my experience. In this country phage E₁ is the most common type. Of the 6 carriers typed in this study, 2 were E₁. A note of possible interest is that 6 of the 20 newly established carriers in this study lived in the same household with previously known carriers, but only one was related by blood.

In the present study, the crucial question is the possible relation of treatment with chloramphenicol to ultimate evolution of the carrier state. Of the 8 carriers who received chloramphenicol, 4 had been given early adequate treatment and 4 were in the delayed or inadequate treatment group (table 5). Carrier rates for all groups given chloramphenicol and for the group given only nonspecific treatment were 1.0 and 2.0 percent respectively. Although the difference is not significant, it is compatible with the idea that such treatment may reduce the carrier rate to some extent. In support of this idea is the rather clear evidence that in many cases early adequate treatment hastens the time of cessation of excretion of bacteria.

Finally, the study provides data on the relation of treatment to relapse and death. Among the entire group of 1,413 cases there were 165 instances of relapse, or 11.7 percent. These were divided with respect to treatment. Many independent investigators have reported an increasing number of relapses among patients treated with chloramphenicol. Mat-teucci and others suggest that this evidence would seem to indicate that chloramphenicol therapy of typhoid fever is suppressive rather than curative (26). Smadel and his colleagues in 1949, working in Malaya with a series of 44 patients with typhoid fever, observed a

striking relation between the duration of chloramphenicol treatment and the incidence of relapses (27). They concluded that chloramphenicol should be administered in adequate amounts if relapses are to be avoided. Later Woodward used interrupted treatment in typhoid fever somewhat similar to that used to prevent relapses in the volunteers with scrub typhus (28). He reported no relapses among the eight cases given interrupted treatment.

However, in this study, it is quite possible that the actual percentage of relapses was higher than indicated since some of the patients may have had relapses after discharge from the hospital. These patients were not always followed. Furthermore, relapses were seldom recorded on the epidemiological record for nonhospitalized patients. Dubos states that relapses occur in about 10 percent of the cases and the "mortality rate in typhoid fever is about 10 percent" (29). He also states that in 60 to 75 percent of the fatal cases death is due to the complications of intestinal hemorrhage or perforation. Smadel and others emphasized that chloramphenicol therapy did not eliminate intestinal hemorrhages or intestinal perforation in typhoid (27).

In analyzing the data in this study, it was observed that complications occurred in 38, or 10.2 percent, of the 372 cases treated with 30 grams or more of chloramphenicol, and in 52, or 12.4 percent, of the 418 cases receiving less than 30 grams. In contrast, the control group consisting of 614 cases yielded 188, or 30.6 percent, complications. Some side effects of chloramphenicol were noted, but these were short lived.

Summary

An epidemiological study to investigate the efficacy of chloramphenicol in the prevention of the typhoid carrier state was conducted among 1,413 cases of typhoid fever which occurred during the 6-year period, 1947-52, in Louisiana and Mississippi. The control group comprised 614 cases which occurred largely in the period from 1947-49. In the treated group were 799 cases which occurred during the period 1950-52.

Only 59.2 percent of the cases were diag-

Group Psychiatric Consultation for Nonpsychiatric Workers

THERE is a need to broaden the education of nonpsychiatric professional groups, such as school teachers and nurses, concerning the nature of mental and emotional problems which they encounter in their work and to increase their awareness of relationships between themselves and their pupils or patients. However, the techniques most effective in consulting with these groups may vary somewhat from those with which most psychiatrists are familiar. Therefore, attempts are being made to determine how a psychiatric consultant can be most useful to agencies not specifically concerned with psychiatry, and to their personnel.

A study of the image which public health nurses and school teachers have of themselves within their professional roles indicates that, in order to satisfy their need for a feeling of professional status, they must be given a strengthened sense of the value of their function and an understanding of motivations for behavior which seems to depreciate their role. The close adherence of teachers and nurses to middle-class mores and the anxieties engendered when these are violated require psychological reorientation to many phases of their work.

Consultant's Role

One of the primary functions of a psychiatrist in a health department or school is the inservice training of nurses and teachers in understanding the problems of mental function and dysfunction. An important implicit goal of such a training program is to increase the effectiveness of these workers by reducing their anxieties and distortions in relationships which interfere with objectivity on the job.

In contrast to the group therapist, the consulting psychiatrist must focus on the worker's

relationship to her work problem rather than on the intrapsychic roots of her conflicts. In order to be most effective, he must be able to gauge the degree of self-awareness of a group, and, in working with nonpsychiatric personnel, he must gear the level of discussion to the tolerance of individuals who are often more naive about



Public Health

MONOGRAPH

No. 53

The accompanying summary covers the principal findings presented in Public Health Monograph No. 53, published concurrently with this issue of Public Health Reports. The author is mental health consultant to the Berkeley City Health Department, Berkeley, Calif.

Readers wishing the report in full may purchase copies of the monograph from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Health Service. Copies will be found also in the libraries of professional schools and of the major universities and in selected public libraries.

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Parker, Beulah: Psychiatric consultation for nonpsychiatric professional workers. Public Health Monograph No. 53 (PHS Pub. No. 588). 23 pages. U. S. Government Printing Office, Washington, D. C., 1958. Price 25 cents.

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Mathematics and Science Teaching

Improving the quality of science and mathematics education in the public schools is more important than increasing the number of students taking such courses, a group of prominent educators and scientists have concluded. A summary of their recommendations, *Guidelines for Science and Mathematics*, was issued in May 1958 by the Office of Education, Department of Health, Education, and Welfare.

This statement emphasized that mathematics and science teaching should develop the capacity of boys and girls to think for themselves, as well as communicate facts. Some specific guidelines offered by the group were:

- Students should have the opportunity for continuous experiences with science from kindergarten through high school.
- Science and mathematics should be taught as basic sciences. The teaching of them should impart an understanding of the methods of scientific investigations and research.
- Able students should be offered at least the first year of college work while in high school.
- Continuous training of science and mathematics teachers is required to keep abreast of the changing methods and knowledge.

Additional recommendations concerned curriculum, revision of textbooks, selection of pupils for advanced courses, the use and training of teachers, and other aspects of science and mathematics education.

The guidelines were developed following a conference of educators and scientists held at the Office of Education, Washington, D. C., in February 1958. Its sponsors were the American Association of School Administrators, Council of Chief State School Officers, American Association for the Advancement of Science, National Association of Secondary School Principals, and the Scientific Manpower Commission.

publications

Register of Air Pollution Analyses as of January 1, 1956. *PHS Publication No. 610; 1958; 331 pages; \$1.75.*

A record of community air sampling and analyses performed in continental United States, Alaska, and Hawaii before 1956 is compiled in tabular form. More than 100 chemically definable individual pollutants or constituents of mixed ones, such as dustfall, are listed for 200 cities in 100 counties of 32 States and Territories.

In addition to pollutants, dates, number of sampling stations, length of sampling periods, sampling frequency, sampling equipment, and analytical methods are listed for each survey. The register also gives literature references and addresses of agencies where results of analyses are recorded. An index of pollutants identifies States and cities in which each was collected and analyzed.

Grants and Fellowships. *PHS Publication No. 624; 1958; 311 pages; 75 cents.*

Health research facilities grants, research fellowships, and research grants awarded by the National Institutes of Health, Public Health Service, during fiscal year 1958 are listed separately by State and institution.

An expanded version of a yearly report on research support, this volume contains a list of the advisory bodies responsible for review of research grant applications and a table showing distribution of grants by States and grantee institutions.

Public Health Records and Related Materials. *PHS Publication No. 612; 1958; 108 pages; \$1.*

Selected articles which have appeared in the *Journal of the American Public Health Association* and *Public Health Reports* from 1952 through 1957 have been compiled in this publication. Emphasizing that records cut across program lines and

involve all disciplines, the selections give examples of specific application of principles for improving recording and reporting in public health work.

Among the suggestions offered are a forms control program instituted as agency policy, work simplification, central control of services to individuals and families, and exchange of information between programs.

The Air Over Louisville. *Publication of Jefferson County and the City of Louisville, Ky.; 1958; 57 pages.*

A summary report of an intensive study of air pollution conducted by the Air Pollution Control Board of Jefferson County, the Public Health Service, and other agencies, this booklet describes a 2-year investigation which began in mid-October 1955. A full-scale technical report on the same study is being prepared by the Public Health Service and will be available at a later date.

Copies of both reports may be obtained from Chief, State and Community Services Section, Community Air Pollution Program, Robert A. Taft Sanitary Engineering Center, Cincinnati 26, Ohio.

Public Health and Hospitals in the St. Louis Area. *American Public Health Association Publication; 1957; 414 pages; \$3.75.*

An evaluation of existing services and facilities and specific recommendations to meet current and potential needs are presented in this study. Hospitals and nursing homes, welfare services, rehabilitation, mental health, nursing, dental health, tuberculosis, child health, and health education are covered.

Based on a survey conducted by the American Public Health Association, the appraisal summarizes data gathered from questionnaires, personal interviews, conferences, correspondence, and public hearings.

The Public Health Service, the Children's Bureau, and the Office of Vocational Rehabilitation participated in the study and helped with staff and consultant services.

Copies of the book may be purchased from the Health and Welfare Council of Metropolitan St. Louis, 417 N. 10th Street, St. Louis 1, Mo.

Administrative Medicine. *Transactions of the fifth conference, October 29-31, 1956. Edited by George S. Stevenson, M.D.; Published by the Josiah Macy, Jr. Foundation; 1958; 197 pages; \$3.75.*

Mental health elements in administration of general health programs, the administrative role in the management of a mental hospital, and techniques and devices for communication and cross-fertilization in the coordination of local resources were the topics at the fifth conference on administrative medicine.

With emphasis on discussion rather than formal presentation, the book retains the conversational style of the conference. Questions, criticisms, and comments by participants are recorded.

George St.J. Perrott, former chief, Division of Public Health Methods, Public Health Service, was chairman of the conference, and several other Public Health Service personnel were members or guests. Copies of the transactions may be purchased through a bookdealer or from Josiah Macy, Jr. Foundation Publications, 16 West 40th St., New York 36, N. Y.

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications other than its own.

psychological matters than are other professional groups with whom he has had experience in his training and mental health clinic work.

In order to influence the content of group thinking, the psychiatric consultant must help to alleviate the anxieties which impede learning by the worker. The major problem of a consultant to an agency such as a health department is determination of the degree to which he can influence the group's thinking, explicitly by direct discussion of an individual worker's involvement in her case and implicitly by a more generalized handling of the material presented for discussion. While explicit discussion is frequently possible when group morale permits, in most cases anxieties can be allayed implicitly without focusing personally on the worker.

The Berkeley Program

From a study of 117 group sessions with public health nurses during a 4-year inservice training program in the city health department of Berkeley, Calif., theoretical concepts and a formulation of objectives and methods of psychiatric consultation have been developed.

The subjects brought up for discussion in these sessions and the reasons given for presenting them indicate clearly that nurses are primarily concerned with their own functioning and have only a secondary academic interest in the theories and dynamics of emotional disturbance. Their interest in human behavior and motivation is based on a desire to be able to work more effectively with the people whom they encounter in their work and to avoid the anxiety aroused by attitudes on the part of those people which they consider antisocial or rejecting of themselves. The real question behind nearly half the subjects the nurses brought up for discussion, apart from their content, was: How can I change the behavior or motivation of the patient to conform to my standard?

In 80 percent of the cases, the psychiatrist sees the nurses' difficulties as primarily due to emotional reactions interfering with their objectivity. Lack of knowledge, techniques, or interviewing skills sometimes contributes to a nurse's uncertainties, but in the vast majority of cases she can solve her work problem once she sees clearly what is going on between herself and her patient.

WHO Publications

International Standards for Drinking-Water. (1958, 152 pages, \$4.00.) Designed to stimulate further investigations of the problem and immediate consideration of the function of water quality criteria in control and improvement of water treatment and provision of safe and potable water to all people. Among sources used in preparing material were The Bacteriological Examination of Water Supplies, of the Ministries of Health and of Housing and Local Government for England and Wales, and Standard Methods for the Examination of Water, Sewage, and Industrial Wastes, 10th edition, of the American Public Health Association.

Insecticide Resistance in Arthropods. (By A. W. A. Brown, 1958, 240 pages, \$5.00.) Exhaustive account, based on some 625 publications and much unpublished information, of the appearance, history, and geographic distribution of resistance for 40-odd species.

Publications of the World Health Organization, 1947-1957: A bibliography. (1958, 128 pages, \$3.25.) Almost 2,000 items, comprising technical, general, and administrative articles and publications, serially numbered and grouped in alphabetical order by subject, with author and country indexes.

Annual Epidemiological and Vital Statistics, 1955. (1958, 699 pages, \$12.00, bilingual edition: French and English.) Eighth annual volume containing such new data as specific mortality rates, by sex and age, for main sites of malignant neoplasms and distribution of cases of communicable disease by sex and age.

These publications may be obtained in the United States, directly or through a bookseller, from the Columbia University Press, International Documents Service, 2960 Broadway, New York 27, N. Y.

Progress in Medical Research on Air Pollution

HARRY HEIMANN, M.D., L. OTIS EMIK, Ph.D., RICHARD A. PRINDLE, M.D., M.P.H.,
and WILTON M. FISHER, M.D., Ph.D.

For 3 years the Air Pollution Medical Branch of the Division of Special Health Services has been working in the increasingly more important but relatively unexplored field of air pollution in its specific relation to human health. The work began with a search for and a systematic appraisal of the scattered sources of knowledge, followed closely by tentative explorations into those parts of the problem holding promise of significant findings. Sufficiently successful results of initial activities helped chart the present course of action, which, in turn, points toward ideas requiring emphasis in the future.

THE Public Health Service has been concerned with the health aspects of community air pollution for many years (1, 2). It was not until 1955, however, when Public Law 159 was passed by the 84th Congress, that the subject was accepted as of sufficient importance in itself to merit separate study. The Air Pollution Medical Program of the Division of Special Health Services was set up for this purpose in July 1955.

Specifically, the Air Pollution Medical Program was charged with the responsibility of determining whether or not community air pol-

lution modified health among human populations. The first part of this charge involved the problem of definitions. What is meant by community air pollution? What are health effects? What should be the ultimate goal of the program?

For immediate use, air pollutants were defined as those materials in the community air that were contributed by the acts of man, excluding biological agents and radioactive materials (3). It was assumed that a community was an urban aggregation which might well cross political boundaries; it would have a large number of people potentially exposed generally to the same atmospheric air. Health effects were defined as those effects which might result in physiological or pathological changes which could be measured by objective techniques. The ultimate goal was seen early to be the definition of those agents in the air which cause deleterious health effects under specified conditions, so that appropriate steps could be taken to prevent or minimize these effects.

A wide variety of specific information was immediately available. For example, it was known that within the United States mortality rates for certain diseases varied from community to community; that eye irritation in the Los Angeles Basin was associated with the local smog (4); and that those who had died during the acute air pollution episodes of London (5), Donora (6), and the Meuse Valley (7) were generally elderly and frequently had preexisting respiratory or cardiac difficulties. From the same episodes and from other data there was evidence that the breathing of irri-

Dr. Heimann is chief, Operational Research Section; Dr. Emik, chief, Laboratory Investigations; Dr. Prindle, chief, and Dr. Fisher, former chief, Air Pollution Medical Branch, Division of Special Health Services, Public Health Service. This paper is based on a report prepared at the request of the National Advisory Committee on Air Pollution. The report was presented at a meeting of the committee in Cincinnati, Ohio, August 28, 1958.

Diarrheal Disease Control Studies

I. Effect of Fly Control in a High Morbidity Area

By JAMES WATT, Surgeon, and DALE R. LINDSAY, Scientist¹

Common consent for years has ascribed to the fly a major role in the spread of enteric infections. Evidence for this belief was incomplete and did not permit an evaluation of these insects as disseminators of disease. The development in recent years of more potent insecticides, particularly DDT, made it possible to plan and carry out an experiment on a broad scale designed to answer the following questions: (1) Can flies be controlled in urban populations by insecticidal methods under the limitations of action imposed by civilian life? (2) What effect, if any, will such control have on the acute diarrheal diseases of the community, particularly those caused by specific infection with the *Shigella* and *Salmonella* groups of micro-organisms?

The basic needs for such a study were: An area with a significant amount of infectious diarrheal disease; a major fly problem; and geographic location which would permit division of the human population along natural lines into two comparable areas, one to be treated, the other to be left untreated for comparison purposes. This latter condition was essential, since it is known that variations in diarrheal disease rates greater than 100 percent occur from year to year and season to season.

Plan of Study

Such an area was found in the Lower Rio Grande Valley of Texas, and at the request of Dr. George W. Cox, State Health Officer, and the local officials, Hidalgo County was selected as the study area.

¹ From the Division of Infectious Diseases, National Institutes of Health, Bethesda, Maryland, and the Entomology Division, Communicable Disease Center, Atlanta, Georgia.

(1319)

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In the first controlled study of the role of nonbiting flies in human disease, Dr. James Watt and Dr. Dale R. Lindsay presented evidence on the importance of flies in the transmission of bacillary dysentery.

Those who investigate effects of air pollution on health are in the position of having a large group of potential agents and no specific disease. We suspect that nonspecific effects of air pollution disease now are classed in the catchall of "degenerative disease," or constitute conditions assumed to occur "naturally" in the population. Such conditions would include chronic bronchitis, pulmonary emphysema, and cardiac deaths.

It was necessary to begin our attack upon a broad front and be ready to change direction as information was gained. The pattern of occurrence of chronic bronchitis and lung cancer, on the one hand, and the episodes in Donora and London, on the other, strongly suggested that there were acute effects producing immediate changes in function, even leading to death, and chronic effects demonstrable only after months or years of exposure, or developing long after exposure had ceased. The study of these two phenomena required different approaches with different methods of identifying and quantifying the effects.

Current Developments

Although there is enough evidence to suggest strongly that air pollution can cause many adverse health effects, reliable medical data are not common. Consequently, we have had to search for facts which could withstand careful scrutiny.

The most important known way in which air pollution influences health is that it irritates, and so may possibly damage, membranous surfaces of the body. Our investigations into the recorded acute air pollution episodes show that the primary effects were observed on the respiratory tract with secondary, indirect, effects on the heart. In the Los Angeles area, air pollution appears to have a primary effect upon the eye membranes. The respiratory tract and the eye are particularly susceptible for the obvious reason that they are in contact with the ambient air; and, therefore, these organ systems will receive special attention in this discussion. However, investigations are underway on other matters such as allergy, cancer, and infectious disease. In a field where few guidelines existed we had to create and formulate new tech-

niques on how to measure and evaluate the culpability of air pollution components, how to simulate actual air pollution in test situations, how to measure lung airway resistance, how to employ animal experimental "epidemiology," and how to establish and use air pollution indexes for expressing relative air pollution levels, relative to such elusive factors as intensity, duration, and locale.

Testing of Lung Function

One thing we have needed is a lung function testing method suitable for screening large numbers of people. Through some of our own staff efforts and our support of research at Harvard University, there is now at least one type of testing machine that seems to be suitable for the purpose (16). It indirectly measures the airway resistance to expiration. At the Occupational Health Field Headquarters of the Public Health Service a group is complementing the work being done at Harvard. They are considering how to provide the equipment and personnel suitable for testing a large series of people in their own communities and to determine how such procedures should be applied.

In addition, research at the University of Pittsburgh (17) and at the University of Cincinnati (18) also is concerned with the effects upon lung function of low concentrations of potential irritants. The development of such methods and tests will play an important role in community health studies, such as the current one in Nashville, Tenn. (19). Used in conjunction with information about environmental influences within a community, this type of objective medical examination can add significantly to the usefulness and reliability of epidemiological investigations.

Epidemiological Evaluations

There is also the classic type of straightforward epidemiological investigation in the program. The first such study was a reevaluation of the health of the population of Donora, Pa. (20) in the light of the 1948 air pollution episode (6). Preliminary data indicate that Donora residents who were adversely affected

tants result in changes in respiratory physiology (8-10). There was evidence that ozone was toxic (11-13) and that rather large amounts were in the air of such areas as Los Angeles (14). There was also evidence that oxides of sulfur were present in many urban atmospheres and that they could adversely affect human health. Further, information from Great Britain indicated that observed variations in morbidity and mortality from city to city for some specific diseases were similar in pattern to the known or assumed intensities of air pollution.

A large amount of statistical data offered potentially useful information. But the data needed to be reoriented since they had been compiled for studies or activities unrelated to air pollution. A statistical section was organized in our program to study the application of these data to our purposes.

Two Courses of Action

We pursued two main courses of action. First, studies were designed to measure the health status of a community to determine whether aberrations in health patterns were related to indexes of air pollution. These activities were largely either field investigations or "desk" statistical studies. Second, studies were designed to define the biological or health effects of single or multiple known or suspected constituents of air pollution. These were largely laboratory studies. Thus, the program was divided between epidemiology and laboratory investigations, with certain activities, such as function testing of lungs, falling into both.

For the statistical work we knew that large bodies of data were in the records of vital statistics units throughout the country. Some quick and some more detailed examinations of these data from the viewpoint of specific diseases were essential to see whether any "good leads" were hidden there. Mortality data provide good, solid quantitative figures, but the quality of such data is not as good. For this reason we also needed to examine morbidity records whose accuracy of diagnosis was likely to be of much better quality. The Health Insurance Plan of Greater New York, the Veterans Administration, the Bureau of Old-Age and

Survivors Insurance, and others collect extensive morbidity information. While such mortality and morbidity data were more or less readily available, we found practically no records of air pollution levels to which we might relate them. We had either to develop some kind of index of air pollution that could be applicable to any community or to use the limited data from those few localities where some air pollution measurements had been made. It was decided to do both. Air pollution indexes were developed based upon populations, industry, and fuel consumption for all American metropolitan areas. Detailed, although limited, aerometric information is being used in intracity comparisons. The analyses of these measurements are in process.

Epidemiology of Air Pollution

In the program's general responsibility for defining health problems of communities as they may relate to air pollution, we are employing, insofar as possible, the methods of epidemiology. This method originally was developed and applied to deal with communicable disease. In epidemics, an identifiable disease is present in unusual numbers in a given population. It is a relatively simple matter to divide the community into those who do or do not have the disease. When appropriate information has been gathered to describe the differences between these groups, it then becomes possible to investigate how the disease agent was distributed and how it was propagated. The contribution of the external factors of the environment can be estimated and, in some cases, even defined. More recently, the general utility and applicability of the epidemiological method, with various modifications, has resulted in its broad use in the study of mental disorders, home accidents, automobile accidents, heart disease, and even population control.

An identifiable disease or condition is not always evident in these studies. Only recently research has identified a group of organisms called the orphan viruses because they were not known to be associated with a disease. Surveys have shown that many people carry antibodies for these same viruses. Further investigation revealed the disease (15).

intense urbanization and, by inference, probably with intense air pollution.

To study specific diseases and body reactions believed to be associated with air pollution, the nature of the irritant action must be considered. While ophthalmologists for many years have used irritant materials to stimulate healing of some types of eye ulcers, experimental animals exposed to sublethal levels of ozone (a respiratory tract irritant) have developed pulmonary fibrosis. In both of these reactions, we have examples of the tissue-stimulating properties of certain air pollution components which in one case were beneficial to the organism and in the other harmful.

Nitro-Olefins

Theoretical considerations based on available data have indicated that, under the peculiar circumstances that may at times exist in the air of the Los Angeles Basin, nitro-olefins may be produced in that atmosphere (26, 27). However, the presence of these compounds has thus far not been demonstrated, probably because of their labile nature. Despite this failure, we considered it important to study the noxious properties of the nitro-olefins. In investigations at the University of Miami to test their toxicity, 18 nitro-olefin compounds have proved to be highly damaging to animals, however they are administered (28). With high dosages, deaths occurred so rapidly that only acute congestion of all vital organs was found. When the specific stress factors of high temperature and humidity were added, deaths of the animals occurred even earlier. This confirmed other toxicological studies reporting that biological stress produced in any one of a number of ways, including physical exertion, intensified the effect of poisons (29). So far this investigation at the University of Miami has also confirmed some of the earlier toxicological studies of nitro-olefins. Our investigator at the University of Miami is now ready to begin long-term exposures to nitro-olefins in low concentrations, simulating what, it is believed, may occur in community air.

An adventitious observation was made in the early phases of the study of the nitro-olefins. The researchers found that their own eyes were

strongly irritated when they handled the compounds or even when they examined the animals that had been treated with them. They, therefore, tried the effect of low concentrations on themselves, and found that at levels of air concentrations theoretically approximating those in the air of the Los Angeles Basin they again experienced symptoms of eye irritation (30). These experiments on eye irritation were repeated by an investigator working in Los Angeles, using a different technique; again, it was observed that eye irritation occurred with exposures to low concentrations of the nitro-olefins.

Ozone, Sulfur Oxides, and Aerosols

Other laboratory studies on the mechanism of action of known irritants have been pursued at the Occupational Health Field Headquarters. Most important were those involving ozone, a gas that has its effect in the deeper parts of the lung. Experimental animals exposed to concentrations lower than those previously considered injurious suffered fatal pulmonary edema (31). Animals repeatedly exposed to quite low, safe-concentration levels developed resistance to later exposures known to be toxic (32). It is possible that such a protective mechanism may be of importance in protecting man's lungs from injury under natural conditions. Exploration of the nature of this protective action has not been successful, so far. The phenomenon may be related to the fact that, in the test tube at least, ozone reacts with protein to form a new specific antigenic agent (33). If such a reaction actually occurs between ozone and the surface proteins in the human respiratory tract, it may explain why some resistance to later exposure occurs.

There was one finding already mentioned in another context that was rather disturbing. When animals breathed sublethal concentrations of ozone daily over a period of months, they developed scarring in the lungs (34).

Investigators working on lung-function testing have found that oxides of sulfur (gases produced by burning sulfur contained in small but significant amounts in many fossil fuels) caused increased airway resistance (8). This, it was observed, occurs with air concentrations

during the 1948 episode were more likely to have more illness later than were those who apparently were not affected (20).

The epidemiological survey of the Detroit-Windsor area, a joint venture by the Governments of Canada and the United States, was begun before 1955. From the data seen thus far, we have been able to deduce some methodological ideas (21).

In Nashville (19), mentioned above, we are evaluating health patterns in a community where air pollution, when it occurs, is primarily soft coal smoke. The Nashville study has four broad aspects: (a) a study of mortality by cause and frequency in relation to place and duration of residence; (b) a study from post-mortem examinations of carbonaceous dust accumulations in the lungs, also in relation to place and duration of residence; (c) a household morbidity survey to find out about acute and chronic disease in relation to place and duration of residence, and in relation, of course, to current air pollution measurements; and (d) a study of the influence of measured air pollution upon cardiorespiratory disease patients, including a group with bronchial asthma.

Laboratory and Statistical Studies

Another important approach with bearing on our field of interest is the observation of the effects of airborne irritants upon animals. There often is a high correlation between the effects of an environmental factor upon animals and its effect upon humans.

There are three ways that animals may be used in such investigations. First, wild and domestic animals may be examined for the effects of naturally occurring pollution. The following are cited as two examples of the many reports demonstrating this approach. Informed that the health of chickens was adversely affected by air pollution in the Los Angeles area, we supported a field study of this phenomenon. Because the results were inconclusive, the experiment is now being repeated under well-controlled conditions. Research conducted at the University of Southern California has shown that both the fertility of mice and the survival rate of newborn mice are reduced by long-continued parental exposure to

inhalation of low concentrations of synthetic air pollution of the Los Angeles type (22).

The second way is to expose the animals under experimental conditions to single pollutants or multiple pollutants whose composition is more or less known. Of two such experiments being carried out at Vanderbilt University (23) the first is to determine exactly where in the respiratory tract the common air pollutant, sulfur dioxide, impinges to cause its effect. The second is to observe one series of animals exposed over a lifetime to sulfur dioxide at known low concentrations and another series exposed to bituminous coal smoke.

A third way of using experimental animals is to establish colonies of different species and strains under controlled conditions, and let them live out their lives in typical, urban areas where they would be exposed to the same atmosphere as that breathed by the human inhabitants. Simultaneously, observations would be made of a group of control animals for which the air is appropriately cleaned to remove the pollutants. We are currently financing such a study at Wayne University (24).

In statistical studies, the work is divided broadly into a study of records of past mortality by cause and past morbidity by cause in relation to environmental factors, including, of course, air pollution. At the same time our statistical unit is looking into recent and current frequency of causes of death and the frequency of illness. In both instances efforts have been concentrated on those clinical entities which might be causally related to air pollution.

The first report to come from our statistical unit was Comparative Mortality Among 163 Metropolitan Areas of the United States—102 Causes of Death (25).

The morbidity data for the current retrospective studies were collected from the Veterans Administration records of veterans receiving disability pensions and from records of persons enrolled in the Health Insurance Plan of Greater New York. From such data we have been able to make a preliminary estimate of the possible biological significance of only a small portion. Certain respiratory tract diseases appear to be frequently associated with

indeed, be significant. At the University Pittsburgh attempts are underway to test effects of irritant gases upon the lung function of experimental animals in which cardio-respiratory disease has been previously produced artificially (17).

In this connection, a Los Angeles pulmonary biologist, during periods of high air pollution, has placed patients with known lung disease at the Samaritan Hospital in a special room where only cleaned air is allowed to enter. After a few hours, these people show improvement in the function of the lungs and so in their well-being.

Chronic Bronchitis

In addition to studying the nature of air pollution effects on specific organ systems, the method of evaluating their effects on human health, we hope to observe the relationship of air pollution to specific diseases. At the California State Department of Public Health, investigations currently are underway on the effect of air pollution on the natural history of the diffuse clinical syndrome called chronic bronchitis (43).

Studies of the natural history of chronic bronchitis have been strongly influenced by experience in Great Britain (44). Air pollution in the British Isles, associated primarily with weather and use of relatively low-grade solid fuel, has been a subject of concern for years. The episode in London in December 1952 (5), to which some 4,000 deaths were attributed, led to intensive epidemiological study. Some significant concepts stem from these current investigations.

For some time chronic bronchitis has held a high place among the causes of death in Great Britain (44), certainly much higher than in the United States. Without going into the attempts to consider all the possible variables that may explain the reasons for the difference, it is the consensus of enlightened British medical opinion that they do, in fact, have a high frequency of this disease and that its occurrence is very likely associated with air pollution. In contradistinction to our predicament, they have identified a disease entity which they can relate to their air pollution.

In effective liaison with the British investigators (45), we are currently trying to clarify the reasons for the difference between their frequency of chronic bronchitis and ours. Prevailing judgment among qualified people is that the frequency of this disease in the United States has been increasing in recent years.

Bronchial Asthma

Bronchial asthma has also received considerable attention, but the results of several investigations are far from conclusive. A study in Pasadena, Calif., under the auspices of the California State Department of Health, involved a preliminary survey of the occurrence of asthmatic attacks in relation to certain air pollution variables (46). The results indicated that there was a doubtful association between certain high air pollution levels and occurrence of asthmatic attacks. This finding was unexpected, to say the least. Observations among asthmatic patients in the Nashville study may be useful in clarifying the matter (19).

One of the newest aspects of the Air Pollution Medical Program is designed to investigate the size of the health problem caused by airborne allergens of vegetative and related origins. Seasonal hay fever, it is estimated, attacks between 1 and 2½ million people in the United States; bronchial asthma is said to affect from ½ to 3½ million persons. We are also obtaining data on the degree of disability that these illnesses cause and their cost to the Nation in loss of working ability.

The concept that simple chemical substances may combine with body proteins to form a new substance which may be allergenic has played an important role in establishing our concern with airborne allergens or allergen precursors. Such precursors, simple chemical substances, may well be present in polluted air. We discussed briefly how ozone combined with proteins experimentally resulted in the formation of a new antigenic agent (28). The significance of that observation is enhanced by a report received a few years ago from the U. S. Army in Japan (47). It appeared that in and about Yokohama some persons of the Army of Occupation and members of their families developed symptoms of bronchial asthma on certain days. This was deemed to be due to

found on occasion in some urban communities. It has also been demonstrated that a derivative of sulfur dioxide, sulfur trioxide, in equal concentration is even more irritating than the dioxide (2). Both gases are produced when fossil fuels are burned. Finally, it was shown that the effect of sulfur dioxide, and of certain other irritant gases, is markedly enhanced by the presence of a solid or liquid aerosol which by itself may not be irritating (35). Aerosols of this type, of course, also commonly appear in the air, especially in urban communities. Irritating gases are not all necessarily enhanced by aerosols; the nature of the aerosol itself also is of significance (36, 37). We are currently studying the possible mechanisms of this phenomenon. The thesis that the effect of an irritant gas on the lung is enhanced by the simultaneous presence of an aerosol, however, is not accepted by all investigators, but the preponderance of medical opinion favors it. Since it is impossible to conceive of natural air without the presence of an aerosol of some type, the matter may indeed be significant.

Tissue, Cell, and Enzyme Studies

Necessarily our studies of the action of these noxious agents on the body began at the primary level. Knowing that the body's response to membrane irritation would evoke a series of protective mechanisms that would mask the effect, we determined that one of the better ways to study membrane irritation would be in isolated cells and cell groups. We are promoting such an activity at Baylor University. Using a mixture probably containing nitroolefins as one of the toxicants, data thus far show that such air pollution adversely affects muscle contraction and leucocyte metabolism in special preparations (38). This continuing work has as its ultimate purpose the elucidation of the effect of such air pollutants upon the enzyme systems that are modified to produce these end reactions.

In line with these explorations, we also employed the tissue culture technique which is relatively unexplored for toxicological studies. This technique is applied to the study of cell preparations, generally of human origin, for changes in growth, reproduction, and metab-

olism. An authority in the field of tissue culture studies at the University of Nebraska undertook the project for us. Using tissue cultures about which a great deal is known (fibroblasts, cancerous cervical epithelial cells, and liver cells), the investigator showed that low concentrations of sulfur dioxide stimulate cellular activity; high concentrations of the gas are lethal (39). The effects of sulfur dioxide, nitrogen dioxide, salts of these acid gases, gasoline, and ozone are under continuing investigation.

Work on the causes and nature of eye irritation has progressed slowly. Research in California has produced some significant findings and it is now generally agreed among authorities that although the eyes of susceptible persons in Los Angeles become irritated when certain air pollution constituent levels are high, there are no objective changes in the eyes (40). In addition, the occurrence of eye irritation under experimental conditions is statistically associated with the presence in the air of a group of chemicals that include the nitroolefins, as mentioned (41).

Explorations at the Occupational Health Field Headquarters show that another body system may be affected by irritation from air pollution. While exploring the mechanism involved in the development of pulmonary edema from ozone, previously described, it was shown that there was a simultaneous decrease of certain enzymes including alkaline phosphatase in the affected lung tissue (42). A search was then made for the alkaline phosphatase level in the circulating blood as possibly being a more convenient indicator of lung injury. Again, the enzyme level was found to be altered. In the present state of knowledge we have not been able to extrapolate these findings to the human. But, if we should succeed in doing so, we may be able to detect the degree of lung injury simply by testing a blood sample.

Cardiorespiratory Disease

At the University of Cincinnati, a detailed study of house-bound cardiorespiratory patients revealed that the diffusion of vital gases across the respiratory membranes into the blood was adversely affected by peak levels of urban air pollution in the Cincinnati area (18). This

be acceptable to all, we do keep in mind that there are airborne materials which may act as adjuvants, enhancing the potential injurious effect of even small amounts of such carcinogenic agents. One of these adjuvant factors is the ability of some airborne compounds to remove and thus activate the carcinogenic polycyclic compound sometimes found adhering to an inert particle (60). Similarly, airborne irritants, because they can slow the rate of removal of potential carcinogens from lung airways, enhance the contact time between the carcinogens and susceptible epithelium (61). Finally, airborne irritants cause some denudation of the surface layers of the lining of the air passages, thus exposing the deeper, more susceptible layers to contact with potential carcinogens (62, 63).

Some investigators have shown that airborne irritants, at least those from cigarette smoke, cause appreciable changes in the epithelial lining of the airways of the human lungs (64). These investigators believe that the changes are directly related to cancerous developments. Regardless of whether or not cancer is so related, it is still important that such irritation causes severe changes in the anatomy and in the functional activity of the human air passages.

The air passages naturally get primary attention in considering the relation between air pollution and cancer; but other tissues and organs also may be affected. A preliminary review of our statistical studies on the frequency of cancer of the esophagus and stomach reveals an association similar to that between air pollution and lung cancer. This finding may be related to some experimental observations wherein it was noted that animals exposed to various dusts showed an appreciable amount of dust in the intestinal tract (65). This finding also fits, to a certain extent, the occurrence of symptoms of stomach irritation that occurred in some of the recorded episodes of acute air pollution (6).

In the closing months of 1958, it appears that we can say definitely that several important and significant findings have emerged from our research on air pollution and its effects on man. Although further study is required in virtually all fields, it is obvious that we have uncovered some very promising leads.

Future Emphasis

Analyzing the progress of our program, we have reached the conclusion that during the next few years we can achieve the best results by concentrating research on five principal subjects:

1. The relationship of air pollution to variation in the geographic distribution of death and disease, by cause.
2. The association between air pollution and the functions of the respiratory system.
3. The association between air pollution and cancer and cardiovascular diseases.
4. The effects of specific air pollutants, singly and in combination, in accordance with the varying chemical and physical properties.
5. The fringe areas of air pollution health research.

Locale and Disease

In regard to the first, we have long known that there are important mortality differences among nations, among continents and, to some extent among ethnic groups. Only recently, however, have we begun to appreciate the fact that there are important differences in mortality among cities and that most of the differences may occur even among different areas within a city. There is now no doubt that urbanization exerts an effect on health. The higher the degree of urbanization, the more prevalent do some diseases become. We know, of course, that among the many variables that may contribute to these differences are the following: climate, socioeconomic status, ethnic or genetic composition, food and water supplies, availability of medical care, and the pattern of customs in medical diagnosis. Despite these other variables, however, we are convinced that air pollution is without doubt an important factor among the many potential causes of geographic variations in mortality and morbidity.

We started late in the field of epidemiology because of conceptual and operational difficulties, the necessity to acquire basic statistical data, and the unfulfilled hope that our initial laboratory investigations would provide information and directions that might simplify the human studies. Much of the required demographic data has now been acquired.

material discharged into the air from industrial operations. From the data supplied, the specific causative mechanism is not known. It cannot be ignored, however, that reports of this nature are rare. A few reports in the medical literature (48-50) have directed attention to an allergic response to sulfur dioxide in air; however, it is perplexing that despite the fact that sulfur dioxide is present in the air of so many urban communities, the reports are so rare. If the matter were looked into thoroughly, more reports might be forthcoming.

Respiratory Infections

Although infectious diseases are primarily the concern, in the Public Health Service, of the National Institute of Allergy and Infectious Diseases and of the Communicable Disease Center, our program has been probing the possibility that air pollutants may modify airborne infectious agents; they also may be a factor when exposed human tissue becomes vulnerable to infection. Early studies by others have suggested that airborne chemicals destroy some airborne bacteria and might, therefore, actually reduce the possibility of air-transmitted disease of the respiratory tract. What was not considered in those early studies was the possibility that air pollutants would alter the body membrane surfaces to make them susceptible to infection. A few years ago, researchers at Johns Hopkins University studied the occurrence of pneumonia in mice exposed to coal smoke and then to pneumococci (51). The data indicated that pneumonia did not occur more frequently in mice exposed to smoke. However, another investigator, working at the Armour Research Foundation under Air Force auspices, exposed animals to low concentrations of ozone prior to their exposure to airborne organisms, and found that pneumonia infection was of greater frequency in the exposed animals (52). We are currently supporting research at the University of California on the influence of ozonized gasoline fumes upon the pneumonia rate in mice, exposed also to a virulent pneumococcus (53).

Lung Cancer

The increase in the frequency of lung cancer throughout the world in recent years has stim-

ulated universal interest. The most recent data point to cigarette smoke as a major factor. Cigarette smoking notwithstanding, some statistical studies have shown that the cancer rate is higher in urban areas with high air pollution levels than in rural areas with low air pollution levels (54).

It is generally accepted that the air can carry materials capable of acting as carcinogens. Acceptance of this belief is based in great part on work done with experimental animals. Industrial experience has shown that the air inside certain factories contains some carcinogens. It is not difficult, then, to understand that many of these same agents are released into the community air. Furthermore, such well-known experimental carcinogens as benzpyrene have been found in community air (55), as well as in exhaust gas from the internal combustion engine (56, 57). Research conducted at the University of California at Berkeley has shown that such polycyclic hydrocarbons can be produced by combustion of even some of the simplest straight-chain hydrocarbons under suitable conditions (58).

Some epidemiological investigations of the lung cancer problem in Great Britain show that there is an association between urban living, frequency of lung cancer, and the presence in the air of certain polycyclic hydrocarbons already known to be carcinogenic for experimental animals. Preliminary statistical evaluation of certain American mortality data in our own program bears out the association between air pollution and lung cancer.

Currently in progress, in the second year of a 3-year job, is an investigation of the carcinogenic potential of the particulate matter collected in nine cities in the United States (59). For these nine cities there are relatively wide variations in lung cancer frequency.

Mucosal Changes in Air Passages

In considering the relationship of cancer of the lung (or possibly of other organs) to air pollution, some people deny a possible causal connection between the two because, they say, the amount of potential carcinogenic material in the air is too small to be biologically active. Although we can see no immediate resolution to the controversy on this matter that would

1. There is evidence that death rates for certain causes of death increase markedly with urbanization. Specifically, these causes include cancer of the lung, trachea, and bronchus, cancer of the stomach and esophagus, arteriosclerotic heart disease, and myocardial degeneration. The increase of lung cancer with population density persists even when the degree of cigarette smoking is held constant (54).

2. Fragmentary evidence of the distribution of cancer mortality within cities appears to be at least partially related to the distribution of air pollution intensity.

3. Certain air pollutants found in our cities are known to be experimentally carcinogenic for animals. Chemical analysis has disclosed many other potential carcinogens in air; these may also be carried by particulate matter deep into the lung.

Admittedly, these findings taken together would justify devoting our entire resources to following them up. However, the total air pollution budget of the Public Health Service, slightly less than \$4 million, with about \$1.5 million available for health studies, has powerful allies in the current annual Public Health Service appropriation for heart research (\$46 million), and for cancer (\$75 million). Consequently, the air pollution program is directed to encouraging those with technical and financial resources to undertake epidemiological and laboratory studies on environmental stresses in the community in general, and on air pollution in particular. For example, cooperation with the National Cancer Institute was arranged to determine the carcinogenic potential of air pollution particulate samples collected from nine cities by the National Air Sampling Network. The protocol was developed jointly with the National Cancer Institute and the Air Pollution Engineering Program. The Air Pollution Medical Program paid part of the cost of the first year. The National Cancer Institute assumed the total cost for the second year.

Animal Studies

The fourth subject deals with the effects of different air pollutants. All our previous expe-

rience indicates that the chemical and physical nature of substances are important in determining their biological effects. We have not devoted much effort to studying the effects of specific substances, largely because our air sampling information indicates that, as an acute problem, the community levels found are too low, and that as a long-term problem it is not possible to isolate effects due to one substance from those due to others. We have, however, promoted research work on the effects of mixtures of pollutants and especially those that generally simulate the type of pollution in Los Angeles. Some of the significant leads that stem from those studies are the following:

1. Certain nitro-olefins believed on theoretical grounds to be present in Los Angeles air may be among the factors that irritate eyes. Synthetically prepared nitro-olefins have been found to be highly irritating and rapidly fatal to animals in acute exposures. At concentrations believed possibly extant in Los Angeles air at times, they cause eye irritation in man.

2. There is diminished oxygen uptake and decreased growth of micro-organisms exposed to simulated Los Angeles type of air pollution.

3. The fertility of experimental mice and the survival rate of newborn mice seem to be reduced by the artificial Los Angeles type of air pollution.

The Los Angeles area has made great strides in controlling its original sources of air pollution. The most important remaining uncontrolled source of pollution in Los Angeles is said to be the internal combustion engine. Because of special budgetary considerations we expect to be able to expend a large sum during the next fiscal year on the study of automobile exhaust gases and their toxicity. These studies will be based in part upon a research facility that will generate, monitor, and analyze various types of light-irradiated exhaust gases and will then feed them to exposure chambers designed to study the effects on vegetation, micro-organisms, and small experimental animals.

Fringe Areas of Research

Our fifth subject, the fringe areas, includes those problems which appear to be of primary concern to researchers who are not in air pol-

What are the principal results thus far of our epidemiological studies, preliminary though they may be?

1. There is evidence that the people who were affected by the air pollution episode in Donora in 1948 have more sickness and a higher mortality rate later than their fellow townsmen of similar ages who were not affected.

2. There is evidence that death rates for certain causes increase directly with degrees of urbanization. Specifically, these causes include cancer of the lung, cancer of the stomach and esophagus, and arteriosclerotic heart disease and certain other heart conditions.

3. Short-term increases in air pollution exposures cause changes in the lung function of persons with chronic cardiorespiratory impairments, and this effect may be delayed for 3 or 4 days after exposure. Exposure to "filtered air" may relieve these symptoms.

Admittedly, these findings are not as definitive or comprehensive as we would like them to be. We feel, however, that they are sufficient to justify the more intensive studies now underway, and those planned for the next few years. This means that we shall continue direct operational support of statistical analysis of morbidity and mortality data, community surveys (such as those at Nashville and Donora), and morbidity investigations similar to those on chronic bronchitis and bronchial asthma in California.

Irritants and Breathing

The second major subject has to do with the effect of air pollution on man's breathing ability. The effects found thus far are essentially those resulting from irritation. The important findings include the following:

1. Irritant gases, such as sulfur dioxide and ozone in amounts similar to those in community air, have an adverse effect upon man's ability to breathe.

2. Continuous or repeated inhalation of ozone scars the lung tissues of animals.

3. Exposure to ozone disturbs the alkaline phosphatase levels in the body, which may indicate that other changes in enzyme and metabolic activity are occurring.

4. Irritant gases cause pulmonary edema and

affect enzyme systems and other physiological mechanisms.

5. Inhalation of some irritant gases mixed with certain aerosols that are usually considered physiologically inert increases the adverse effects of the gases.

6. On the other hand, repeated inhalation of small quantities of ozone, and possibly other gases, appears to result in a significant degree of increased resistance to the acute effects of ensuing heavier exposures.

These findings have resulted in the main from experimental exposures of animals. Their extension to human beings poses obvious difficulties of varying degrees, and in a few instances, efforts of such extension have already begun. We expect to continue to support and carry out the significant leads by the following: (a) evaluating pulmonary function; (b) continuing research grants in basic and applied pulmonary physiology; (c) direct investigations of effects on animals exposed to irritant pollutants; and (d) research contracts to groups using basic and applied physiological techniques. Although the basic laboratory work involving biochemistry, enzymes, and tissue cultures has shown promise, the findings can not yet be extended to man. Because of the basic nature of this research it is best supported by the research grant mechanism.

Cancer and Heart Disease

Our third major subject includes lung cancer, and possibly other cancers, as well as cardiovascular diseases.

No one can deny that heart disease and cancer are two of the important diseases in this country today. Together, they account for 54 percent of all deaths (66). Lung cancer, although accounting for only 1.8 percent of deaths (66) has been increasing rapidly in recent decades. Statistical studies relate this increase in lung cancer to cigarette smoking. A similar association has been shown with heart disease mortality, which, although less startling in percentages, is even more impressive in total numbers of deaths. What light, if any, have studies on air pollution thrown upon the causes of these diseases?

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lution work. One example is that of the inhalational allergies. This subject is divisible into two aspects. First, the familiar plant pollens, causing hay fever and similar reactions. Second, the question of whether or not chemical conditions in air can cause allergic reactions in some susceptible people.

Another example in this fringe area is the effects of air pollutants which reach the gastrointestinal tract. If our pilot studies of such questions indicate the serious possibility of important findings, we are prepared to follow through.

Long-Range Goals

We have described a blueprint for the near future. These are the things we are doing now or will be doing during the next 2 or 3 years. Medical research in air pollution from the long-range aspect, we believe, will be the following:

First, we think we shall some day return to the consideration of effects upon cells and tissues. Methods will eventually be developed whereby we will be able to extrapolate the observed effects to intact animals and to human beings. Controlled exposures of isolated cells and of tissues will then be a screening device.

Second, we expect that we shall develop realistic maximal permissible concentrations, based on reliable studies and adaptable to the industrial and meteorological conditions of a given city.

Third, we think that the public health engineer and the public health physician will participate much more in studies of community ecology, in planning and zoning programs, and the like. The advantages and disadvantages of alternative proposals may be evaluated, not only in aesthetic and economic terms, but with reference to present and future effects upon the health of the community.

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New Laws Affecting Health Activities

The following legislation affecting health was passed by the 85th Congress during its second session:

P. L. 85-544 authorizes the Surgeon General of the Public Health Service, for fiscal years 1959 and 1960, to make training grants totaling \$1 million annually to schools of public health (H. R. 11414).

P. L. 85-664 extends the Hospital Survey and Construction Act for 5 years (H. R. 12628).

P. L. 85-589 amends the Hospital Survey and Construction Act to permit applicants to obtain loans in place of grants for the construction of hospitals and related facilities (H. R. 12694).

P. L. 85-777 extends for 3 years the Health Research Facilities Act, which authorizes \$30 million annually for research construction grants (H. R. 12876).

P. L. 85-840, among other Social Security Act amendments, increases by \$5 million each the annual appropriation authorizations for three State grant programs administered by the Children's Bureau: maternal and child health, crippled children, and child welfare (H. R. 13549).

P. L. 85-908 provides for White House Conference on Aging in 1961 and authorizes Federal financial aid for preparatory State conferences (H. R. 9822).

P. L. 85-926 provides for grants of up to \$1 million to institutions of higher learning to expand educational opportunities for mentally retarded children through teacher training and other programs (H. R. 13840).

P. L. 85-929 amends the Food, Drug, and Cosmetic Act to prohibit chemical additives in food that have not been pretested for safety (H. R. 13254).

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in a wide range of areas. Surprisingly, lack of funds was given as the major reason for not expanding chronic disease laboratory services. Lack of space and lack of trained personnel were listed as other obstacles.

If funds and personnel were available, 15 States indicated they would undertake blood sugar determinations, 14 would do Papanicolaou smears, 13 would do blood grouping, and 9 would start blood chemistry. Many other types of testing would be initiated in other States.

In a supplementary inquiry, the Division of Special Health Services, Public Health Service, recently polled the State health department laboratories again, using regional office staffs to gather the data.

We were interested mainly in learning the extent to which some of the basic tests were being performed by State laboratories. The results corroborated the earlier findings. A great deal of valuable work is being done along these lines.

No fewer than 19 States reported blood sugar testing: 9 of these were engaged in screening; 5 in routine quantitative testing; and 5 reported use of the clinitron.

Nine States test for blood cholesterol.

Twelve have programs for examining Papanicolaou smears.

Five do rheumatic fever (antistreptolysin titer) testing.

Two test for rheumatoid arthritis.

A variety of other tests are being performed by one or more States, including, of course, blood grouping, blood typing, and urine analyses.

Although it appears that a significant amount of chronic disease testing is performed by many State health department laboratories, we must face the fact that 20 States reported no testing of any kind for noninfectious diseases. I believe that this picture will change. It is bound to.

New Tests and Machines

Several exciting new tests and possibly even more exciting new machines are now being used by testing laboratories.

The Papanicolaou smear is not a new test,

but its application in large-scale casefinding programs is relatively new. Recognition by the public health and medical professions of the great possibilities of the cytological test for cervical cancer is truly exciting. This simple, usable, and teachable test has brought one important phase of cancer prevention within the range of classic public health and preventive medical practice. The laboratory has made this possible.

Another exciting cancer advance is perhaps foreshadowed by the work of Dr. Claude Hitchcock of the University of Minnesota, who reports that screening for low acid content or absence of acid in the stomach is an effective means of diagnosing gastric cancer in the asymptomatic phase.

Screening 12,000 men and women over a 10½-year period, Dr. Hitchcock found the incidence of cancer 4½ times greater among patients with no acid or a low acid content of the stomach. He recommends annual gastrointestinal X-ray examination for the latter group and an examination every 9 months for the former group.

In the bentonite flocculation test, a type of colloidal clay (bentonite) is mixed with normal human gamma globulin. When the test is positive the clumping or flocculation of the mixture can be seen under a microscope in a few minutes. This test was positive 85 percent of the time when used on 82 verified cases of rheumatoid arthritis at the National Institutes of Health.

A new approach to the prevention of rheumatic fever is heralded by a testing process employing a fluorescent dye to "tag" serum antibodies. (See *Public Health Reports*, October 1958, p. 884.) This method, if it proves applicable, promises to be fast and simple. Positive results may be reported on slides containing only 200 bacteria. Conventional tests require as many as 100 million organisms, the culturing of which may take a week or more. Most laboratory technicians can perform the fluorescent dye tag test, given the training and equipment.

Never in the 70-year history of public health laboratories in this country has the development of new laboratory tests moved at so rapid a pace as during the last decade. Fresh progress is reported monthly.

The Chronic Disease Laboratory in Public Health

ALBERT L. CHAPMAN, M.D.

IN A TIME when the triumphs of technology have literally made real many of man's most fanciful dreams, I may be pardoned if I venture some bold ideas about the future of laboratory work in public health.

I honestly believe that we shall live to see the time when laboratory tests will penetrate the mysteries of the chronic diseases. I believe that, ultimately, laboratories will be able to identify most, if not all, of the leading chronic diseases through simple, valid tests that will be economical to perform.

For example, the "fingerprints in the blood" which we are only beginning to understand may eventually reveal through the analysis of a single blood sample the presence or absence of a whole array of chronic conditions. Most important, such future testing can detect the presence or even the threat of a chronic disease in ample time to heed the warning.

Medical science, by its conquest of the infectious diseases, has not ended an era. Rather, it has opened an even greater era, which will be known in history for victories won over the chronic diseases. And, as in years gone by, laboratories again will be the shock troops in the attack that has now commenced.

Some 70 years ago, a small room in the Marine Hospital on Staten Island, N. Y., was set aside as the first Public Health Service laboratory. It wasn't long before States set up similar laboratories all over the country. These laboratories have been landmarks in the progress of

the modern public health movement in the United States.

Epidemiology, the central discipline of public health, cannot exist without the laboratory, any more than the automotive industry can exist without highways.

No reminder is necessary of the amazing progress in laboratory testing in recent decades. Progress has been equally notable in pathology, biochemistry, toxicology, bacteriology, mycology, parasitology, and serology.

In an effort to determine the extent to which State public health laboratories had expanded into the chronic disease field, the American Public Health Association's Committee on Laboratory Services in the Chronic Diseases sent out a questionnaire in 1957 to State laboratory directors.

Having been granted the privilege of quoting from the interim report based on that questionnaire, may I first commend one of its introductory statements:

"Since the chronic diseases fall for the most part in that category of illnesses . . . in which secondary levels of prevention, such as early diagnosis and treatment are important, it seems obvious that the laboratory should have a place in their control."

In connection with this philosophy, a most important finding of the questionnaire is that 20 out of 32 State laboratory directors who responded believed in the need for providing chronic disease services in their laboratories. Only 7 of those reporting did not so believe.

The interim report shows that 11 State laboratories are now performing a significant number of tests in the chronic disease field in addition to blood grouping or blood typing.

Certain States (Maryland and Wisconsin are discussed in the interim report) are already engaged in large-scale chronic disease testing

Dr. Chapman, an Assistant Surgeon General, is chief of the Division of Special Health Services, Public Health Service. This article has been adapted from an address by Dr. Chapman at a meeting of the Western Branch, American Public Health Association in British Columbia, Canada, on May 20, 1958.



MAN and Environment

CONFERENCE REPORT

To examine research needs in the modern environment, the National Institutes of Health, upon the recommendation of its Study Section on Sanitary Engineering and Occupational Health, called the Conference on Man and Environment in Washington, D. C., May 5-6, 1958. The following pages carry information from six of the papers presented.

To mention only a few of the testing machines, machines that are as exciting as the new tests themselves, the great utility of the Papanicolaou smear may now be enhanced tremendously by an electronic machine called the cytoanalyzer. This device supplements the technician in the microscopic search for malignant cells. Abnormal cells are counted electronically on the basis of structural characteristics. The cytoanalyzer, when perfected, has the potentiality of screening thousands of slides daily. Seldom has an invention more perfectly fitted the needs of casefinding.

For blood analysis, among several new machines introduced on an experimental basis is the autoanalyzer which performs, through the use of automatic colorimetric analysis, routine determinations of urea, sugar in blood, and calcium in serum. The results of the analysis of the blood sample, indicating the concentration of certain substances in the blood, are permanently recorded every 90 seconds, permitting 40 determinations an hour.

Disease "Fashions" and the Laboratory

Laboratory practices reflect the current "fashion" of prevailing disease. Today, blood is being fractionated and the characteristics of these fractions are being determined by many new methods: spectroscopy, electrophoresis, and paper chromatography. A whole new armamentarium of disease detection is slowly but steadily being developed.

During the early decades of the 20th century when such diseases as smallpox, malaria, diphtheria, pneumonia, typhoid fever, tuberculosis, dysentery, and the communicable diseases of childhood were the primary threat to life, laboratory practices reflected the logistical importance of these diseases.

With the aging of our population and the relative increase in incidence and importance of the chronic noninfectious diseases, laboratory practices are slowly but steadily beginning to reflect the growing importance of these currently more "popular" diseases.

There has been a significant lag in the widespread use of available tests for noninfectious diseases, few as they are, partially because of difficulties in retraining professional and other laboratory personnel in new methods of laboratory analysis. Some of the lag can be attributed also to the belief that public health laboratories should not become involved in tests for noninfectious diseases; and some of it has been caused by the scarcity of precise and economical tests.

But much of the lag, in my opinion, can be traced to inadequate funds and inadequate staffing of public health laboratories. These inadequacies, of course, are attributable in large part to the lack of appreciation of the value of laboratory procedures in the early detection, diagnosis, and control of the chronic, noninfectious diseases, and the lack of public and professional support for expansion of these activities.

When mass chest X-ray programs were first introduced, the demands for the services of private radiologists increased because of the many new cases of treatable tuberculosis that were found. I am confident that this phenomenon will be repeated when adequate methods and facilities are developed and put into widespread use to insure the early detection of unsuspected cancer, diabetes, heart disease, and arthritis. In fact it seems that the importance and stature of clinical pathologists will rise in direct proportion to the expansion in the number of laboratory tests that are done on apparently well persons for the purpose of identifying asymptomatic diseases.

The battle against these noninfectious killers is a common battle. The private physician and the clinical pathologist are fitted to lead and direct the various campaigns against them. Public health physicians and their staffs and the directors of State and local health department laboratories and their staffs are in a position to give invaluable assistance to private physicians and clinical pathologists so that the efforts of all of the professional groups concerned may be effectively coordinated. Through their joint action, the public is bound to benefit.

what has resulted from the profound changes wrought in the industrial environment by modern technology.

Why are we not more deeply concerned about what has been happening to us during the last half century within the revolutionized environment of our daily work? The time has come when we must carry out physiological and hygienic research hand-in-hand with technological research and when we must develop the techniques of industrial hygiene stepwise with the technology of production.

Health in an Industrial Society

If we are concerned about our industrial population, we also should be concerned about our population generally, for the industrial environment has become, to a remarkable extent, the national environment. This environment which man has created for himself now provides the challenge to both curative and preventive medicine, a challenge that requires additional types of medical knowledge, new medical skills, and new settings.

What of the artificial situation in which many new materials, possessing infinite possibilities for metabolic modification, find their way into the body of man? Is it not evident that our attempts to detect signs of the early or late injurious effects which may follow the absorption of these materials over a period of years or a lifetime are somewhat crude and even naive?

We shall never be able to anticipate and visualize the harmful potentialities of new materials until we achieve a comprehensive understanding of the role of the normal elements and other components of the living organism. Within such a comprehensive background, however, we could probably discover metabolic deviations induced by chemicals now within the organic milieu.

No principle of biology is clearer than that which relates a physiological response to a quantity of stimulus within appropriate time limits. The living organism is resistant in varying degree to varying stimuli, and the stimulus must be adequate to induce a response. Upon this principle we differentiate between harmful and harmless stimuli. In these terms, toxicity relates not to a specific substance but


to the concentration of a substance within certain time limits in the tissue or chemical system of an organism. A toxic environment, therefore, is one which, within certain time limits, introduces a harmful quantity of a substance into the organism.

In modern times the changes man has wrought through his technology have brought about greater environmental changes of more profound physiological significance than have all the previous generations of men. The time has come, however, when a much greater and more comprehensive knowledge of the consequences of our changed and changing environment is essential for our safety and perhaps for our very survival.

Technology has created a wealth of materials and captured the forces of nature for man's use, but it has failed to bring an understanding of their biological effects that will keep these forces and materials under control. The gap between technology and biology must be reduced before it is too late. It must become an axiom of modern chemical and technological research that the materials produced and the energy harnessed must be as well understood for their biological potentialities as for their physical and mechanical properties.

Reckless man can release or build up physical forces which may destroy himself and his kind. Probably, however, the same ingenuity which has enabled him to explore and to penetrate other secrets of nature will serve him when he expends it in learning more of his own vulnerability and in developing the means for self-protection.

Water Supply

 Our research needs may be stated simply: to augment supplies of water by novel means, to reduce water loss, and to treat polluted water for re-use.

By 1975 the use of converted sea water to augment the water supply in coastal cities may

Based on a paper by Mark D. Hollis, Assistant Surgeon General and chief sanitary engineering officer of the Public Health Service.

The Modern Environment

brief

It is not necessary to study vital statistics to perceive some of the more glaring hazards of modern life. Yet the severity of these hazards cannot be viewed in proper proportions without quantitative information. Many departures from an earlier way of life have occurred within the past two generations, and thus the vital statistics of any earlier time and the mechanisms for their collection are hopelessly inadequate.

We are aware, however, of a heavy toll of deaths and injuries on the highways and in the homes; of accidental poisonings, especially among children, so numerous as to require regional and local poison centers for the prompt transmission of information and advice; of public apprehension concerning the functions of airborne carcinogenic agents, whether from the partial combustion of petroleum or tobacco, in inducing or contributing to the induction of lung cancer; of heated controversies over the treatment of community water supplies; and of the contamination of foodstuffs with insecticides and other foreign substances. And we contemplate with great uneasiness the dispersion in the air and the deposition on the land and in the sea of increasing quantities of radioactive substances. These are on the horizon of the average citizen.

Certain other features of the modern environment appear to have graver significance in their capacity for present and future harm. Never before has man at work been surrounded by so many obvious as well as insidious dangers to health, limb, organic integrity, and life itself.

By the study of accidents and illness we learn the causes of injury, disease, and death. But what are the consequences, throughout a working life, of the almost daily impact of individual and collective insults of minor or subclinical severity? Those with more complacency than curiosity, with more faith in physiological adaptability than can be justified

by medical evidence, and with undue comfort derived from crude statistics will respond that the people in no previous society have been known to die young in such small numbers and to live to be old in such large numbers. The easy conclusion is that Americans are healthier now than ever before and that modern life holds no very serious threat to health. But consider the facts less superficially.

Changing Statistics

The microbiological era of medicine and public health has profoundly changed the practice of medicine, has brought into existence and cultivated the techniques of preventive medicine, sanitary engineering, and public health, and has made revolutionary changes in the statistics of human morbidity and mortality. The microbiological diseases, almost to the exclusion of all others, have occupied the attention of the medical practitioner, the investigator, and the educator for more than 50 years. Only recently, compelled by the changes in the causes of illness and death, has attention begun to shift proportionately to chronic degenerative diseases.

Meanwhile the environment of the Nation's population has been changing. The microbiological threats to human life and health have been replaced by the inanimate threat of the machines and materials which inventive man has made, and by the forms of energy with which he has surrounded himself. The physical basis of modern industry is something new under the sun—an environment which, in the making, has taken so much of man's total time, effort, thought, and ingenuity as to leave him little to expend on learning what might be its ultimate effects upon himself.

Not only is the incidence of occupational disease unknown because suitable mechanisms for reporting and assembling information are lacking, but great areas of industry are not under such observation as would provide this information. It is by no means certain, therefore, that the effects of the composite hazards of industry have not affected the national health since, in our gross morbidity and mortality statistics, the brilliant results of microbiological prophylaxis and therapy may have masked these effects. We do not know, and we have no present means of knowing, just

Based on a paper by Robert A. Kehoe, M.D., director, department of preventive medicine and industrial health, University of Cincinnati, Cincinnati, Ohio.

generation, in spite of knowledge that the conventional rapid sand filter is less effective than properly controlled chemical coagulation in turbidity removal and less reliable than breakpoint chlorination for micro-organisms.

The assessment of the public health aspects of viruses in the water environment requires improved methods for recovery and identification of viruses, especially in the treatment of water. Also the transmission of infectious hepatitis virus through contaminated water emphasizes the need to develop a tissue culture technique for the growth of this virus.

These are some basic problems of water supply. Should we concede that the routine identification of unknown substances, inert or organic or viable, in water is too difficult? Because of this difficulty, would it be practicable to require the polluter to purify waste completely? Are we giving sufficient attention to the possible adverse cumulative effects of foreign materials in drinking water?

Or, in view of the level of health in our metropolitan areas, are we magnifying unduly our water supply problems? Our concern about some of this is admittedly potential and based on lack of data, especially of the toxicological implications.

For the immediate future, professional judgment will have to be applied to these issues. But the supporting data, through research, should be sought as promptly as is feasible.

Water Pollution

brief The impact of the development of modern metropolitan areas is of great significance in man's environment.

The total population growth of the United States has not only been high but has been taking place almost entirely in the Nation's 174 metropolitan areas, which the Bureau of the Census defines as areas containing at least 50,000 persons with population densities, by counties, exceeding 150 persons per square mile.

The 16,000 units of governments and 3,000

Based on a paper by Ralph E. Fuhrman, executive secretary, Federation of Sewage and Industrial Wastes Associations, Washington, D. C.

special districts within these metropolitan areas give a measure of the complexities of administration in such tasks as the collection and disposal of waste water used by their inhabitants. A recent book, *Special District Governments in the United States*, decries the multiplicity of these units, and its author, J. C. Bollens, concludes that special districts are justified for schools but feels that other activities should be returned to local governments.

If a sanitary engineer surveyed the collection and disposal of waste water in metropolitan complexes, he would certainly conclude that special districts are justified for sanitary engineering activities as well as for schools. The fact that the metropolitan area is being used more and more in providing for waste water disposal would seem to justify them.

Perhaps a study of this approach could either assure its continuation or point the way for improved and more economical approaches to water pollution control in metropolitan areas. Such a project would have important economic as well as engineering aspects.

Odor control in sewers, pumping stations, and treatment plants is a definite need in waste water treatment. Fundamental work on odor-causing compounds and odor intensity measurement was done at Harvard University more than 25 years ago. Since that time much has been written about sources of odors and how these may be controlled through cleanliness in the plant and chemical treatment.

While cleanliness is essential, the fullest control of odors has been achieved at the Owl's Head plant in New York City through plant housing with exhaust gases discharged through a stack after treatment with ozone. A circular trickling filter at Sarasota, Fla., uses plastic covering on an aluminum frame for a filter cover. Research in odor control could be a re-evaluation and extension of the work at Harvard. Experience to date seems to indicate that the most reliable control is the housing of plant units and treatment of the exhaust air. Basic information on the economy of various designs would be helpful.

Further research in higher degrees of waste water treatment could also be done. At present a 90 percent removal of B.O.D. is looked upon as "complete" treatment. However, satisfac-

be feasible and perhaps routine. Novel methods under study offer promise that the ocean may be effectively and economically tapped. At present full-scale plants can distill sea water at a cost of \$1.75 to \$2.80 per 1,000 gallons. The goal is \$0.30 per 1,000 gallons.

While present weather modification techniques may be crude and ineffective, we must accept them as a potential means of increasing the supply of water. The President's Advisory Committee on Weather Control concluded that cloud seeding produced an average increase in precipitation of 10 to 15 percent in mountainous areas of the western United States.

A substantial part of our future water needs may be met by conservation of flood waters, control of losses through evaporation, recharge of aquifers, and the use of hexadecanol in monomolecular layers on water surfaces.

A 10-foot stratum of sandy soil of average porosity underlying a watershed will hold the greatest single flood flow likely to occur on that watershed. Although we now have no way to use water-bearing strata effectively in flood containment and water conservation, more intelligent use can be made of underground reservoirs to supplement surface storage.

Water lost by evaporation in the United States exceeds the amount taken for use in cities and towns. It has been estimated that evaporation from storage units now under construction in the Colorado River system will equal more than one-third of the replacement storage they provide. Research on the use of monomolecular films of long-chain fatty alcohols to suppress evaporation, however, supports optimism concerning the ultimate ability to reduce evaporation by nearly one-half.

Reclaiming Water

Water supply research, however, must concentrate on new processes to reclaim water. Reuse of water is complicated by the growing number of contaminants in solution. The treated drinking water of a community contains an intricate mosaic of stable organic chemical structures which reflect the past history of the supply. To this burden of chemicals, the community adds its increment of solids, including soluble, persistent, nonoxidizable compounds

like the alky-benzyl-sulfonate component of detergents. The Nation's use of detergents, 3 billion pounds per year in 1956, is expected to double within the next decade.

Drainage from land treated with insecticides, weedicides, and other materials adds to the load of persistent organics now being recovered from all parts of the main stem of the Mississippi River. DDT, in a concentration of 5 ppb, was recovered from Lake St. Clair on the Canadian boundary. The Department of Agriculture's large-scale imported fire ant control operations in the southeastern States eventually will apply dieldrin and heptachlor to some 30 million acres. The United States' production of pesticides and other organic agricultural chemicals rose from 125 million pounds in 1947 to 570 million pounds in 1956.

Management of impoundments, including municipal water reservoirs, for recreational use is also influencing the character of drinking water.

Conventional yardsticks of pollution, B.O.D. (biochemical oxygen demand) and coliforms, give few clues to the presence of these synthetic organic pollutants. Advanced studies on adsorption may indicate useful supplementary treatment for municipal water supplies. Methods for separating dissolved solids from water also are being investigated in connection with desalination.

The toxicological significance of organic chemicals in drinking water has not yet been adequately evaluated. Because of the high cost of toxicological evaluation, a short-time, presumptive test to determine the chronic toxicity potential of specific or complex materials is required.

Particulates and Viruses

Concern with dissolved contaminants does not detract from the familiar problem of particulates. One of the most surprising findings in the recent Chanute, Kans., study was the large amount of organic debris of particle sizes up to 20 microns appearing in the filtered water. This observation supports the opinion that a critical review of filter design criteria is in order. These criteria have not been changed in any important respect in the last



to ban by fiat either of these two classes of reactants. It is my opinion that the practical form of control of such reaction products will prove to be a selective elimination of those species of primary compounds determined to dominate the identified chain reactions.

Sulfur Compounds and Aerosols

Still missing is considerable information about what happens to sulfur compounds in photochemically activated atmospheric systems. Prof. H. Fraser Johnstone and associates are contributing valuable experimental evidence of the rate of formation of SO_3 from SO_2 in the presence of moisture and catalytic particles, and Dr. Mary Amdur has produced evidence of enhancement of SO_2 toxicity by the presence of NaCl aerosols of small average particle size. But there are numerous theoretically possible interactions among SO_2 and the assorted organic and inorganic free radicals believed to form in polluted air during irradiation.

Dr. Amdur's work has also shown the possibility that some species of aerosols influence the toxicity of some kinds of gaseous pollutants. Another function of aerosols, suggested theoretically and supported by the experiments of Prof. Jack G. Calvert and associates at Ohio State University, is the possibility that specific kinds of airborne particles act catalytically to a significant degree in the photochemical system.

Effects of Specific Pollutants

Prolonged dosages at low levels of concentration of highly reactive oxidants, free radicals, and condensation products of the photochemical reactions of organic compounds are strongly suspect in various chronic and acute diseases of the respiratory system. Which are culpable, if any? At what levels of concentration do they cease to be troublesome over long periods of exposure? Do they produce or predispose to carcinomas of the lung and other sites? Does long exposure to any of them at some level of concentration affect longevity, work efficiency, or general well-being? Do any of them, specifically or in combination with other circumstances, affect respiratory or

other restrictive systematic impairments? All these questions need to be answered.

Analysis

For a long time in the future, the tools available will limit the understanding of atmospheric reactions and their products, the effective monitoring of pollutant levels, and useful pollution surveys. Instrumentation and analytical methods for air pollution work need to be inexpensive, simple, direct, and specific in principle and in operation. New and cheaper methods for establishing patterns of pollution movement in all three dimensions of the air reservoir will be essential for regional zone planning.

It is reasonably suspected that, of the numerous measurements habitually incorporated into air pollution surveys, only 1 or 2 give information fully as useful as that obtained by collecting all the measurements in any given local situation. One of the most pressing immediate needs is the provision of bases for selecting 1, 2, or 3 simple, direct indexes of pollution related to identifiable patterns of pollution sources.

These subjects for research could certainly be extended into the engineering control of sources of pollution. As technological changes occur in manufacturing processes, transportation, and commerce, a continual procession of new abatement techniques will be demanded and developed.

The Next 50 Years

Much less certain, however, are the major air pollution concerns of the next half century. The following suggestions are based on a few indications of what seems destined to affect the air supply or improve our capability for cleansing it.

Pollution by radioactive chemicals. A considerable body of opinion insists that the airborne products of nuclear fission and fusion processes are endangering the health of present and future generations. Nothing foreseeable will prevent the continued exploitation of atomic energy for peaceful or military purposes. Inevitably, local and worldwide prob-

tory disposal of treated hydrowastes will become more necessary in future years because the volume of wastes to be treated will increase and the volume of a receiving stream will remain constant.

With the processes now established, stabilization ponds or intermittent sand filters may be relied upon to reduce B.O.D. residuals to 5 percent or less. But devising processes practicable where the large areas required for these methods are not available would aid the reclamation of water for re-use for purposes other than drinking or cooking.

It is important to watch continually the publication of research reports. Unpublished research work remains hidden from most other researchers. For this reason, all research, whether or not it appears productive, should be reported at its conclusion so that the wasted effort and money to repeat it can be avoided. As a minimum step, condensations of lengthy reports or theses should be offered for publication in the technical press.

Re-use of Water

brief The most important research needed in water pollution is in the reclamation and re-utilization of waste waters. Acute shortages of fresh water, long a problem in the arid west, are beginning to plague areas of the midwest, east, and south as the demand for water skyrockets. Man's greatest impact on his water resources is his increased demand for fresh water and his reckless pollution and abandonment of once-used water.

Among the consequences demanding new or improved knowledge are:

- The survival rates and destruction mechanisms for all types of pathogens in various treatment processes.

- The calculated risk in health hazards and other detrimental effects associated with use of waste waters for irrigation, recreation, stock

watering, and perhaps for human consumption

- Mechanisms for the removal or inactivation of sulfates, nitrates, and phosphates, especially in waste waters being used for ground-water recharge.

- The modifications of polluted water as it flows through porous media of varied geochemical composition, and, conversely, the effect of such water upon soil structures.

- Systems analysis in the water balance of an area.

Air Pollution

brief The following listing of the present problems of air pollution is a composite of the convictions of a number of informed people. It is probably significant that each one suggested essentially the same listing, although there was no general agreement on the relative importance of the items.

Chemistry of Air Pollution Systems

Substances causing eye irritation, accumulations of ozone, damage to vegetation, and possible physiological damage in man appear to be labile, transitory constituents of an ever-changing system and therefore have proved difficult to measure or identify. Their existence appears to depend on the photochemical formation of free radicals, if indeed certain types of free radicals are not responsible for the observed and suspected effects. Since the existence of free radicals is essentially co-terminous with the activating solar energy, capture and analysis apart from the continuously activated system have not been accomplished or seriously attempted.

Of course, the primary reactants involved in the chains of reaction can be recognized; in Los Angeles the elimination of oxides of nitrogen and of organic vapors, especially the unsaturated compounds, would effectively inhibit the formation of the suspected labile intermediate compounds. But it has proved difficult

Based on a paper by J. E. McKee, professor of sanitary engineering, division of engineering, California Institute of Technology, Pasadena.

Based on a paper by Leslie A. Chambers, director of research, Los Angeles County Air Pollution Control District.

to ban by fiat either of these two classes of reactants. It is my opinion that the practical form of control of such reaction products will prove to be a selective elimination of those species of primary compounds determined to dominate the identified chain reactions.

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Meteorological control of local air pollution. Significant strides toward long-range weather prediction have been made during the past 20 years, and some progress toward local modifications of meteorological phenomena has been reported. Our imminent capability for satellite observation of air movements and the availability of nuclear energy makes it worthwhile to consider modifications of regional meteorology to assure more adequate air movement.

Effect of air pollution on world climate. Some evidence has been advanced that combustion processes are adding CO₂ to the atmosphere so rapidly as to cause accumulation in spite of the water reservoirs with which this gas must be in equilibrium. A significant change in CO₂ level in the air could, in theory, produce profound effects on world climate. Worldwide monitoring of CO₂ concentrations, an International Geophysical Year project, might well be continued.

Jurisdiction in air pollution control. Many of these situations imply the extension of air pollution study and control beyond local, State, and national jurisdictions. Already a need has appeared in a few regions to establish acceptable procedural and survey patterns that will permit authorities to act jointly. Preparation for concerted action among governments will be essential to effective application of technological principles.

The problems we face are increasing in some exponential relationship to national and world populations. Almost all the environmental factors demanding attention are of two kinds: those involving competition for finite amounts of the materials required for human existence, and those resulting from the accumulation of byproducts of the human utilization of such substances.

Thus air, water, and basic nutritional, industrial, transport, and energy requirements become the foci of efforts to maintain health, reasonable living standards, and some comfort in the face of an exploding population. Sooner or later health agencies will have to face the fact that 600 million people cannot live well in the waste products of resources capable of sustaining half that number.

Food Technology

brief

Food processing and distribution is about an \$80 billion industry, the largest in this country. Concomitant with the industry's growth there has emerged a need for further information about the effects of processing upon food.

The food processor today is well aware that he must consider the factors of color, flavor, texture, convenience, stability, aesthetics, nutrition, and safety, all of which influence consumer acceptance.

To maintain or obtain the desired color it is at times necessary to use particular processes or chemicals. Fundamental work on natural colors and the various processing treatments influencing them is greatly needed. Intensive studies are being conducted on the nature of flavor and the effects of various processes and storage conditions.

In recent years convenience has received more attention than any single factor in the processing of foods. In many foods convenience has dictated the use of a great variety of chemicals and new processing techniques and the mixing of various food components. A large amount of work remains to be done on the stability, safety and nutritional properties of these products.

Other Consumer Influences

Stability, or shelf life, is extremely important in all foods, for practically none are imperishable under adverse temperature conditions. Deteriorative changes resulting in loss of flavor, color, texture, and nutritive value occur very commonly during storage. At State food conferences being held to encourage better nutrition, much is said about variety in the diet and proper nourishment, but nothing is heard about storage deterioration and its possible effect on nutrition.

These deteriorative changes may also be important from the standpoint of safety. There is some evidence that the chemical products re-

Based on a paper by Emil M. Mrak, chairman, department of food technology, University of California, Davis.

sulting from such changes can be harmful and some may affect appetite. The need for research in food stability during storage is apparent.

The aesthetic values of foods are a major consideration. While insect contamination is probably not harmful, it is repugnant and chemical fumigants are used to control it. There should be sufficient data to support the view that these fumigants are safe.

The nutritional value of foods is of prime importance. Consumers generally believe that fresh products are far superior to canned, frozen, or dried foods, yet we know that fresh products can deteriorate very rapidly in acceptability and nutritive value. Because of improper harvesting, distribution, and handling of fresh foods, I would not be surprised to find that, on the whole, processed foods have better vitamin retention than the fresh.

Food processors must be careful about chemical residues, insect fragments, and other such items in their products, but relatively little attention is given to these in marketing fresh produce. There is a need for extensive studies on the acceptability, nutrition values, and general quality of fresh produce.

Changes in Processing

Great changes are taking place in canning procedures. The so-called short high-temperature procedure is receiving more consideration because of a possibility of increasing case yields, faster operation, and better color and flavor. However its relationship to storage stability, nutritional value, and acceptability of the produce is not completely known.

The rapidly increasing rate of production of frozen foods, particularly precooked or partially cooked dishes, makes it improbable that an adequate study has been made of the changes in microflora that occur during this type of processing.

Concentration of foods by the use of a vacuum at relatively low temperatures is now a common

processing procedure. However, a great deal is yet to be learned about its effect on enzymes, chemical changes, microbial survival, and vitamin retention.

Circumstantial evidence indicates that food-borne infections are fairly common, but to my knowledge the amount of work being done to investigate them is limited. How extensive is salmonellosis? Are staphylococcus infections increasing? Would not a thorough understanding of the causes of these infections and the development of control procedures be better than prescribing drugs after infections?

Today most of our foods are packaged. The Food and Drug Administration insists that safe materials be used in packaging; nevertheless we need to know how these materials may affect food.

The food industries are mechanizing as rapidly as possible even though the effects of mechanization on acceptance, nutritive values, and storage characteristics are not completely understood. For example, the bulk handling of cling peaches from the farm to the consumer is almost a reality, yet we do not know the results such handling will have on the fruit. Last year transporting peaches in water in plastic containers was tried. Those in the containers for 6 hours had a low acceptability because of off flavors.

If we are to give the consumer canned peaches that are perfectly safe, with highest vitamin content and best color and flavor, it is important to know what happens between the orchard or processing plant and the consumer. Quite possibly some treatment during processing may adversely influence storage of the product, causing a loss in nutritional value or color or even the production of compounds resulting from deterioration.

Food should be considered from the time the seed is planted, the egg is laid, or the animal born, until it is consumed. So much can happen to food as it passes through various stages, and any one factor may so markedly affect it, that nothing can be overlooked.

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Australia for the first isolation of antibiotic-resistant strains in hospital populations, the development of bacteriophage typing as a new tool in staphylococcal research, and for the first demonstrations of the epidemiological patterns of hospital-acquired staphylococcal disease.

"The Symposium on Staphylococcal Infections sponsored by the New York Academy of Sciences in February 1956 brought together for the first time in this country much of the existing knowledge of the twin problem of antimicrobial resistance and staphylococcal infections in hospitals. Shortly thereafter, epidemiological studies began to appear, showing not only the nationwide prevalence of resistant strains in hospital populations, but the spread of such hospital-acquired infections into local communities.

"Since then, concern has mounted in research, clinical, and public health circles. In October 1957, for example, the Association of State and Territorial Health Officers recommended that the Public Health Service seek funds to expand its technical assistance to the States on staphylococcal problems.

"In December, the American Hospital Association, through its Council on Professional Practice, appointed a Committee on Infections Within Hospitals. This committee consulted with the Joint Commission on Accreditation of Hospitals and with the Public Health Service concerning staphylococcal infections and in May 1958 issued a bulletin recommending action in hospitals and local communities. Earlier in the year, the American Academy on Pediatrics, through its Committee on the Foetus and the Newborn, issued a supplement to its standards for the management of premature and newborn nurseries, calling for special attention to staphylococcal infections.

"For the current fiscal year, Congress appropriated \$325,000 to the Public Health Service for the Communicable Disease Center's laboratory services, training, investigations, and epidemic aid in staphylococcal disease, and added \$1 million to our research appropriations for the expansion of staphylococcal research through National Institutes of Health research grants.

"Last April, I asked the American Hospital Association's Committee . . . to advise me on

New Agents Counter Staphylococcus

Two antibiotics were reported to be apparently effective against staphylococcal strains, at the Sixth Annual Symposium on Antibiotics, October 1958 in Washington, D. C. In 2 years of clinical trials of vancomycin, no resistant staphylococcus bacteria were encountered, according to Dr. M. M. Kirby and two colleagues of the University of Washington. They added that in 30 patients who were administered the drug in the last year results were dramatic in instances where other antibiotics had failed.

Another antibiotic, kanamycin, was presented as a highly effective bactericidal agent with a broad spectrum by researchers at the University of California and Wadsworth Veterans Administration Hospital. They described its use on 100 patients.

Also, Dr. Paul A. Bunn and Dr. Aldona Baltch of the State University of New York Upstate Medical School report in the *New England Journal of Medicine*, October 2, 1958, that kanamycin has been found "to have an inhibiting action against most staphylococci that are penicillin-resistant" in the treatment of 25 severe and acute infections in the adult.

this problem of national action. What are the immediate needs? And how can the Public Health Service best help to meet them? These consultants agreed that:

"First, knowledge of the existing problem of staphylococcal disease and the means for its control needs to be consolidated and brought home to the medical and health professions at all levels as quickly and as impressively as possible. A national conference should be called to develop a practical plan and to stimulate State and local action.

"Second, a complete review and careful expansion of staphylococcal research should be undertaken. In this area of need, the National Institutes of Health has been busy.

"The third need expressed by my consultants was for expansion of services to assist hospitals in preventing and controlling staphylococcal disease. This cannot be done, we all know, without high-quality bacteriological and epidemiological services and very few hospitals have such services intramurally. Laboratory

The National Conference

on

Staphylococcal Disease

THE NATIONAL CONFERENCE on Hospital-Acquired Staphylococcal Disease was held in Atlanta, Ga., September 15 to 17, 1958, under the joint sponsorship of the Public Health Service and the National Academy of Sciences-National Research Council.

The conference brought together delegates from 59 professional organizations and specialists from universities, independent laboratories, and hospitals.

In the opening address, Dr. Leroy E. Burney, Surgeon General of the Public Health Service, underscored heavily the importance of blocking hospital-acquired staphylococcal disease from invading the public environment. The threat, he said, "involves the development of antibiotic resistance and emergence of specific epi-

demic strains, with the concurrent threat to hospital populations and the community at large."

Other highlights of his address follow:

"Staphylococcal disease has rarely presented itself in modern times as a public health problem requiring an organized community attack, and not until now as a problem of national significance and growing magnitude. Only recently have the several professions involved in medical, hospital, and public health services begun to understand the dynamics of staphylococcal disease and hence to recognize our dependence upon one another for its control.

"We in the United States . . . must give the palm to our medical and public health colleagues in the United Kingdom, Canada, and

officer should be invited to be a consultant to the committee.

Responsibilities

The hospital infectious committee should have the following major areas of responsibility:

Surveillance. The committee should regularly collect complete data on all infections acquired within the hospital, on those occurring among recently discharged patients, and determine the presence of a problem, if one exists. These data should be consolidated into formal reports for submission to the medical staff and the hospital administrator.

Control. The committee should be charged with the responsibility of evaluating all phases of hospital operations pertaining to the control of infections, recommending changes, establishing appropriate patterns of antibiotic usage, and instituting epidemic control measures.

Nevertheless, this committee should in no way relieve the department heads of responsibility for making decisions and executing recommendations with reference to particular department problems.

Education. The committee should sponsor an educational program for all hospital personnel, presenting current concepts in the proper prevention and control of hospital-acquired infections.

It is recognized that the effectiveness of any system for dealing with hospital-acquired infections will depend upon a continuing, active program directed to all professional and nonprofessional groups.

Mechanisms of Operation

Mechanisms of operation will vary considerably in the individual institutions. Frequent and regular meetings of the committee are essential to maintain a high level of interest. One of the measures of effectiveness of the committee will be the thoroughness with which advice is implemented into action. Determination of the effectiveness of the committee should rest primarily with the committee and the medical staff, and not with possible inspecting agencies.

Ample emphasis should be placed on surveillance, since the major defect in delineating the staphylococcal

problem is the lack of uniformity in recognizing and reporting staphylococcal disease. Of the several methods of surveillance considered at this conference, routine culturing of all infections received the most support. In applying this method, culture results are routinely reported to the hospital infections committee for investigation, review, and classification. The final classification of each case should include the committee's determination as to whether or not the infection was acquired in the hospital. Surveillance of this type may be facilitated by the utilization of a standardized reporting form.

INTERHOSPITAL

Because patients acquiring infections in one hospital may subsequently be admitted to another and because of the frequent interchange of personnel among hospitals, interhospital communications are essential to infections control. Such communications might be developed by establishing infections committees in the local medical societies, with representatives from the hospitals in the area. Interhospital communication might also be achieved by the addition of members of the staffs of other hospitals to the membership of the hospital infections committee.

HEALTH DEPARTMENT

The health department can be of considerable help to the hospital in controlling infections by providing laboratory services, epidemiological consultation, and assistance with surveys of illness among discharged patients. To attain optimal communications between hospitals and health departments, the health officer should be made a consultant to the hospital infections committee.

OFFICIAL REPORTING

Official reporting of staphylococcal diseases is difficult because of the ubiquity of minor community-acquired staphylococcal infections. No specific recommendation concerning voluntary or compulsory reporting of staphylococcal diseases is made. Some delegates felt, however, that mandatory reporting of staphylo-

coccal disease during the first 6 weeks of life might be helpful. Diseases in this age group to be reported might include pyoderma, breast abscess, empyema, and osteomyelitis. Other conferees feel that it is feasible to report all staphylococcal infections provided the reporting forms are simple. In some States, staphylococcal disease is now notifiable. The reporting programs of these States warrant careful evaluation.

Patient Care

ADMISSION POLICY

It is known that some patients are more susceptible to staphylococcal disease than others. Since hospitals may represent a significant reservoir of staphylococcal infections, individual hospitals should reconsider their admission policies regarding highly susceptible patients. In many instances, these patients might be better managed in the home.

Patients with staphylococcal disease requiring hospitalization should be recognized as a potential danger and proper precautions instituted at the time of admission.

ISOLATION

Infected patients are a major source of hospital infections. Ideally, all infected patients should be placed in strict isolation. This ideal is often unattainable. Priority then should be given to isolating those who are most likely to spread infection to others; for example, patients with pulmonary staphylococcal infections or with exposed foci of suppuration. In addition, it is advisable to isolate certain patients who are especially susceptible to staphylococcal infections, such as those with extensive burns or exfoliative dermatitis.

The transportation of patients with staphylococcal infections from one area of the hospital to another, while often necessary, may be dangerous. It is recommended that these patients be covered with sterile sheets during transport. Careful cleaning and disinfection of the areas in which they have been examined or treated should be a routine procedure.

identification of staphylococci, epidemiological consultation, epidemic aid, nursing consultation, and other services such as are common in State health departments—and through them, in the Public Health Service—will be needed in increasing volume as more hospitals begin to explore and control their staphylococcus problem.

"In this area, of course, the Communicable Disease Center is the Public Health Service's right arm. Staphylococcal disease has been given the highest priority throughout the Center. The laboratory, for example, has accepted responsibility for the National Reference Center for Staphylococcus Phage Typing. Diagnostic reagents are being prepared on a large scale by the Communicable Disease Center. Also, its Epidemic Intelligence Service physicians and nurses have been working full time on epidemiological studies in response to increasing requests for help. Training courses for laboratory workers are being developed and a wide variety of new training aids are being prepared. We expect that all of these services will be expanded rapidly as the national program gains momentum."

As the conference progressed, the participants scanned all facets of the hospital-acquired disease. They took inventory of current knowledge by presenting papers during general sessions, and by open discussion in three small groups, assigned respectively to nursery, surgical, and general medical activities in the hospital. Finally, the delegates framed a set of recommendations which Dr. Burney hoped would be "accepted as 'marching orders' for every group concerned with sick and healthy people in this campaign against staphylococcal disease."

Appearing in this issue of *Public Health Reports* are the conference recommendations, Dr. Harry F. Dowling's résumé, and a paper on the community aspects of hospital-acquired staphylococcus infection by Dr. Frederick H. Wentworth and associates. Dr. R. E. O. Williams' report on the staphylococcus situation in Great Britain appeared in the November 1958 issue, p. 961.

The full proceedings of the conference were published in October 1958 by the Communicable Disease Center for distribution to hospitals, medical societies, and health departments.

Synthesis of Recommendations

General Recommendations

The conference accepts hospital-acquired staphylococcal disease as a serious problem of global scope. There are major difficulties in comparing the incidence of infectious now being observed with that in previous years, but it is generally accepted that convincing evidence establishes the problem as a serious one and that definite action on the part of hospitals and other community agencies is imperative.

Communications

INFECTIONS COMMITTEES

It is unanimously agreed that the establishment of hospital infectious committees is a sound approach to the recognition, prevention, and con-

trol of hospital-acquired staphylococcal disease. The conference endorsed the recommendations of the American Hospital Association and the Joint Commission on the Accreditation of Hospitals. The following recommendations concerning the composition, responsibilities, and mechanisms of operation of such committees deserve special emphasis.

Composition

The hospital infections committee should consist of active, interested members of all major hospital departments, including administrative, clinical, nursing, housekeeping, and laboratory. The committee must have complete administrative back-

ing. The chairman or coordinator of the committee must be a person of stature. It is generally agreed that the bacteriology laboratory is the area through which most information about infections should be channeled. It is recommended that a bacteriologist, pathologist, or clinician with interest in bacteriology, be a permanent member of the committee and that he or some individual be charged with maintaining the day-to-day record of infection. This person should serve as hospital epidemiologist.

It is recognized that the composition and size of the committee will vary considerably from hospital to hospital, depending upon their physical and personnel resources. The committee should make free use of small subcommittees of key people for specific assignments. It is also recommended that the local health

sheets, blankets, and mattresses may play a role in the spread of infection, and thus deserve special attention.

Patients admitted to the hospital should be furnished with clean blankets, sterilized linens, and clean mattresses. Cleanliness of mattresses may be approached through the use of disposable or nondisposable plastic covers.

STERILIZATION

Because sterile technique is so fundamental to the prevention of hospital-acquired staphylococcal disease, techniques of sterilization and disinfection require constant attention and reevaluation. Meticulous checks, both thermal and bacteriological, on the effectiveness of ordinary methods of sterilization should be routinely carried out. The need for sterilization of certain kinds of equipment, such as stethoscopes, ophthalmoscopes, and sphygmomanometers, should be reconsidered.

Personnel Carriers

Carriers of staphylococci among hospital personnel present one of the more difficult problems in the control of hospital-acquired staphylococcal infections. There are really two problems here. The first is the individual with a frank lesion, the other is the inapparent carrier who is without overt lesions.

FRANK INFECTIONS

It is strongly recommended that hospital personnel, including physicians, nurses, and others, who develop frank staphylococcal lesions should be excluded from duty until the lesions are healed. It is further recommended that:

- A continuous program of education of all personnel emphasize the hazard of staphylococcal lesions to the welfare of the patient.
- Personnel be required to report the presence of lesions to a central clinic or to a designated physician.
- All reported lesions receive prompt diagnosis and therapy.
- A policy be adopted to prevent financial loss to personnel who are barred from duty because of frank lesions.
- During an epidemic or period of

increased incidence of staphylococcal disease, active search be made for the presence of lesions among the personnel. Such a program can be appropriately directed by the infectious committee. In searching for carriers, a thorough physical inspection should be made to detect those who may have hidden but dangerous lesions; for example, in the axilla, buttocks, and perineal region.

THE INAPPARENT CARRIER

The majority of hospital personnel may be shown at one time or another to be carrying coagulase-positive staphylococci on their skin or mucous membranes. It must be stressed that most of these carriers are not hazardous to the patients, because they either disseminate very few staphylococci or the particular strain of organism which they are carrying is of low transmissibility or pathogenicity, or both. The mere presence of coagulase-positive staphylococci, therefore, is not grounds for removal of a carrier nor does it constitute an indication for antibiotic therapy. Thus, routine surveillance for carriers is not recommended.

During an epidemic or increased incidence of disease, it is essential that a thorough search of all personnel be made for carriers of epidemic strains associated with the

outbreak. The usually accepted method for finding carriers is restricted to nasal or nasopharyngeal culture surveys of the personnel. In instances where carriers of epidemic strains are not found by this technique, it might be helpful to extend the examination of personnel to other potential portals of exit, such as the hair, throat, perianal skin, and stool.

Carriers of epidemic strains associated with the outbreak should be considered "dangerous carriers" and should be removed from duty. Many carriers, even the temporarily dangerous ones, will cease to carry the epidemic strain upon their removal from the contaminated environment. The status of the individual carrier must, therefore, be periodically evaluated and after his reversion to negative, he should be returned to duty.

When an epidemic strain persists in a carrier, his permanent removal from duty must be given careful consideration. Such victims should receive assistance in the form of new job training.

Many substances such as antibiotic nasal jellies and sprays have been used both for the prophylaxis and for local treatment of carriers. The conference is unable to recommend any of these procedures at the present time but urges their evaluation.

Specific Recommendations

In addition to those recommendations which apply generally to the detection and control of hospital-acquired staphylococcal disease within the hospital, the conference has made certain recommendations which apply specifically to a particular service within the hospital.

Nursery

DISCHARGED INFANTS

It is characteristic of staphylococcal disease in newborn nurseries that the vast majority of infants do not develop lesions until after they have been discharged from the hospital. In order that the hospital may become aware of a staphylococcal problem within the nursery as early as

possible, some method needs to be devised for detection of infections among the discharged infants. Several methods have been used for this purpose: telephone surveys, questionnaire surveys, routine visits by public health nurses, or culture surveys of infants at the time of discharge. The conference generally recommends the telephone survey as being most desirable in epidemic situations because of its efficiency, promptness, and ease of administration. However, all of the methods enumerated have been shown to be effective in some communities, and the hospital infections committee should decide which one to use after consultation with other community

It is becoming increasingly apparent that techniques of isolation have fallen into disuse and are unfamiliar to both professional and nonprofessional personnel. Consequently, as practiced, they are often ineffective. It is strongly recommended that the hospital infections committee carry out continuing programs of education in isolation procedures. (See the section on hospital sanitation for recommendations on sterilization, disinfection, and hospital design).

DIAGNOSIS AND THERAPY

Certain techniques formerly considered minor, such as venipuncture, intravenous cannulation, clisis, catheterization of the urinary bladder, and aspirations of body cavities, indeed all procedures which interrupt the normal skin barrier, may produce important portals of entry for staphylococcus infections. It is recommended that these procedures should be kept to a sensible minimum and always be performed with strict asepsis.

The conference considered both the general problems of antibiotic therapy within the hospital and the application of antibiotic prophylaxis to the control of infections.

General Antibiotic Usage

There was unanimous condemnation of the indiscriminate use of antibiotics and acceptance of the need for plans to govern their judicious usage. No single plan has yet been found to be satisfactory for application in all types of hospitals and therefore specific recommendations cannot be made. It is urged, however, that hospital infections committees give priority to a study of this problem and design an orderly approach to meet their own needs.

Antibiotic Prophylaxis

With certain exceptions, antibiotic prophylaxis to prevent staphylococcal infections has not proved to be a useful or desirable procedure, and it is not recommended.

One exception to this recommendation may be made in the nursery epidemic situation where antimicrobial prophylaxis against the specific epidemic strain may be the method of choice for the interruption

of an epidemic (see Specific Recommendations, Nursery). Other exceptions may be made for certain types of patients who are at special risk. In these cases, antibiotics should be used only after careful deliberation by a group or committee concerned with the problem.

It is unanimously agreed that prophylactic antibiotics do not prevent staphylococcal infections in clean surgical wounds, but that they may tend to mask or attenuate the appearance of the infections. It should be emphasized that the most important points in surgical wound management, whether the wounds are operative or traumatic, are asepsis and meticulous, careful technique, combined with the removal of all devitalized and contaminative foreign material, and closure of tissues with maintenance of an adequate blood supply.

Hospital Sanitation

The widespread occurrence and hardy nature of the staphylococcus stimulated considerable discussion of the importance of high standards of environmental sanitation. The recommendations are grouped into those concerning hospital design, ventilation, housekeeping procedures, and sterilization and disinfection.

HOSPITAL DESIGN

Basic to the effective application of aseptic technique is the provision of proper equipment and space allocation for their implementation. Certain deficiencies in hospital design are becoming apparent, but because present knowledge does not permit definitive recommendations about changes in hospital architecture, caution must be exercised before undertaking extensive building alterations in the hope that they might limit staphylococcal disease within hospitals.

On the other hand, it is recommended that hospital administrators seriously consider such alterations as are necessary to bring existing facilities up to standards currently recommended by the American Academy of Pediatrics, the American Hospital Association, and State and local health departments.

In addition, scientifically controlled research studies should be conducted to determine, for example, the optimal design for newborn nurseries and to demonstrate the validity of minimum standards currently recommended for the elimination and control of cross-infection.

HOSPITAL VENTILATION

Cognizance was taken of the many studies describing a reduction of the concentration of bacteria in the environment following the installation of various types of ventilation equipment. It is agreed, however, that these methods have not been adequately evaluated in terms of their specific effect upon the prevention of infection. No recommendations concerning changes in existing ventilating systems were made, but it was suggested that proper cleansing and maintenance of air conditioning systems now in operation should be a routine hospital housekeeping procedure.

HOUSEKEEPING PROCEDURES

There is growing evidence that poor housekeeping techniques contribute to the dissemination of hospital-acquired staphylococcal infections. It is agreed that effective housekeeping demands constant vigilance on the part of both the administrative and professional staff and can be effectively accomplished only when all groups give due recognition to this aspect of disease control. It is recommended that the hospital infections committee periodically evaluate all parts of the housekeeping routine, giving special attention to adequate dust control, acceptable techniques of floor cleaning, sterilization of equipment, and laundry procedures.

As recent studies have focused attention on the laundry and its role in the dissemination of infection, it is recommended that great care be given to insure that contaminated linen and blankets, particularly from patients with staphylococcal disease, not be mixed with other laundry, that contaminated trucks not be used for transporting clean laundry, and that clean and dirty laundry never be transported concurrently. Evidence suggests that

ices, they are essential to the detection of sources of nursery epidemics and their control; and are helpful in the control of outbreaks or in other services. However, it is strongly recommended that hospital laboratories adopt some systematic method of saving isolates of staphylococci from infected individuals, so that in

Special Recommendations

In addition to the recommendations which have been made for the hospital and hospital services, the conference has made certain special recommendations concerning the provision of certain services and the request for assistance from certain agencies.

TERMS AND CLASSIFICATION

An ad hoc committee on the terminology and classification of staphylococcal disease should be established. It is agreed that considerable confusion exists because of the lack of agreement in the use of such terms as apparent and inapparent infections, disease, sepsis, clinical or subclinical infection, and asymptomatic carrier. Many difficulties result from attempts to compare data in published reports that fail to distinguish the carrier state from colonization and disease or sepsis. It is strongly recommended that a subcommittee be formed to define terminology that will clearly differentiate these various terms and clarify the vocabulary applicable to staphylococcal diseases.

the eventuality of an outbreak, it will be possible through bacteriophage typing to trace the events that led to the epidemic. Policies concerning the length of time cultures should be saved and the selection of strains for bacteriophage typing can appropriately rest with the infections committee.

In addition, the committee should be requested to provide a classification and grading of infections which could be used as a guide by individual hospitals in their surveillance programs.

EDUCATION AND TRAINING AIDS

The conference recognizes the need for education and training aids to support the national program necessary for the control of staphylococcal infections in hospitals. It is strongly recommended, therefore, that the chief of the Communicable Disease Center ask appropriate interested organizations, including the American Hospital Association, the American Medical Association, and the American College of Surgeons, to designate representatives to form an interagency clearinghouse or coordinating committee for educational materials, such as audiovisual aids and literature. Such a committee, by joint sponsorship, would encourage the production of the best possible material, would avoid unnecessary duplications, and would keep all concerned aware of activities in this field.

METHODS MANUAL

Although much useful information regarding adequate sterilization and disinfection procedures has been published, it is currently scattered in many relatively inaccessible publications. It is recommended, therefore, that all available information on sterilization of special equipment, environmental disinfection, and the most recent methods of sterilization be collected in readily available manual form and distributed by the Public Health Service or some other appropriate agency.

HOSPITAL VENTILATION

Because aerial dissemination of infection may play an important role in the transmission of hospital-acquired staphylococcal disease, there is a need for a correlation of information by the medical, epidemiological, and engineering professions. Therefore, the Public Health Service is encouraged to arrange a conference of interested representatives of these professions to examine the whole problem and develop sound standards.

LABORATORY MANUAL

Attention is called to the fact that the Communicable Disease Center Laboratory in Atlanta, Ga., has recently assumed the responsibility of providing reference laboratory services for bacteriophage typing. A manual of acceptable procedures for the precise identification of staphylococci has been produced with the assistance of a subcommittee of this conference.

In Résumé

We have hammered out the many things that we know and that we do not know about staphylococci. We know the cultural characteristics of the organisms, their prevalence in hospital patients, hospital personnel, and persons outside of hospitals, and the frequency with which they are found in the hospital environment. We know how, roughly, to determine whether a strain is potentially pathogenic, how

to identify individual strains, and how to trace their spread from person to person. We do not know how to determine the invasiveness of an individual strain, nor its pathogenicity, with certainty, nor its virulence. We do not know how to prevent the spread of staphylococci from one part of a person's anatomy to another, nor from one person to another person.

We know the prevalence of strains of staphy-

ageucies, especially the medical society and health departments.

It is generally recommended that surveys of discharged infants be carried on by the hospital, but it is recognized that in many communities the health department can assist with or can conduct the survey.

Surveys of this kind can obviously be conducted on either a periodic or continuous basis. Some hospitals carry on continuous surveys as part of their general disease surveillance program. Other hospitals conduct periodic surveys. Often a routine sampling of a portion of discharged patients is satisfactory. It is strongly recommended that all hospitals institute some type of survey procedure.

ANTIBIOTIC PROPHYLAXIS

In some instances, nursery epidemics appear to be self-propagating and result in a high incidence of colonization or frank disease among the infants due to an epidemic strain of high virulence. In such situations, it is possible to protect infants from colonization by administering an effective antibiotic in full therapeutic doses to all infants beginning immediately after birth and continuing until after discharge. Antibiotic prophylaxis of this type effectively prevents colonization of the infant's nose and thus his skin and allows time to search for dangerous carriers among the personnel, and to locate and correct breaks in aseptic technique. Antibiotic prophylaxis should be used only after very careful evaluation of the situation, preferably by the infections committee, and should never be used for prolonged periods nor be used on a continuous basis.

PERIODIC CULTURING

Available evidence suggests that specific strains of staphylococci which can be detected by phage typing are capable of producing nursery epidemics. In contrast with the other services in the hospitals, therefore, it may be profitable to survey the nursery personnel periodically in order to detect carriers of these particular strains. Such surveys should be undertaken routinely only in well-equipped hospi-

tals and should be considered as combined research and control procedures.

Surgery

OPERATING ROOMS

Separate operating rooms for clean and "dirty" surgical cases are not recommended. Rather, all operating rooms should be cleaned between operations and meticulously so after an operation on a contaminated case. The same meticulous care must be applied to sterilizing contaminated linens, instruments, and operative clothing.

SCHEDULING OF OPERATIONS

It is recommended that "dirty" surgical cases be placed at the end of the operating schedule.

OPERATING ROOM TECHNIQUE

The entire operating room team must be constantly alert for breaks in technique. Excessive talking (chatter) has no place in the operating room. Operating room clothing must not be worn outside the operating suite. Caps and masks must be changed between each operation. All visitors to the operating room must change completely from street clothing before entering.

SURGICAL DRESSING TECHNIQUE

Every effort should be made to minimize cross-infection through contaminated dressing carts and faulty dressing care.

PERSONNEL CARRIERS

Personnel found to be carriers of coagulase-positive staphylococci of any type should be allowed to continue on duty in the absence of an increased incidence of surgical wound infections. Even when a problem does exist, the removal of carriers should be delayed until one is certain that all other possibilities, such as defects in sterilization, have been ruled out. The one exception to this general policy is the nurse or physician who is known to be a carrier of an epidemic strain and comes from a service where there has been or is a problem.

While these recommendations apply to the inapparent carrier, it is strongly recommended that all per-

sonnel with frank staphylococcal lesions remove themselves from the surgical suite until the lesion is healed.

Medical Services

Distinct differences in the pattern of staphylococcal infections on medical services as contrasted with surgical and pediatric services are recognized. Nevertheless, it is agreed that a substantial staphylococcal infection problem exists on medical services also and the need for constant attention to aseptic techniques and control measures is just as imperative here as elsewhere. This need is important not only to prevent infections among medical patients, but also because of extensive commingling of patients among services to control spread of disease throughout the hospital.

Laboratory Services

INITIAL ISOLATIONS

Bacteriological services of a high caliber are essential to the diagnosis and therapy of staphylococcal disease and to the detection and control of hospital-acquired staphylococcal infections. It is recommended that hospitals throughout the country include in their laboratory programs the initial isolation of staphylococci, coagulase testing, and antibiotic sensitivity testing. It is recognized that there is presently a certain amount of unreliability with the disk method of antibiotic sensitivity testing, but it is noted that the Food and Drug Administration is presently adopting standards in an effort to correct these defects. While the serial tube method is admittedly more accurate, it is considered to be too time consuming and expensive for routine use. Therefore, most hospital laboratories must resort to the disk method for establishing the antibiotic sensitivity of staphylococci.

SPECIFIC DIAGNOSIS

Bacteriophage typing is not practical in most hospital laboratories at the present time, but specific diagnostic services should be available when needed. While there is little routine need for such serv-

when the staphylococcus causing an epidemic in a nursery is sensitive to a specified antibiotic. The surgeons even differed as to whether the poorly absorbable antibiotics should be administered prior to bowel surgery, although they did agree that antibiotics will not prevent infections from developing in clean surgical wounds. The suggestion was made that spraying of the noses of carriers may eliminate the carrier state in some persons, but it was recognized that more study is needed in this area.

Of course, a most important means of control is to eliminate the infection at its source, in other words, to treat the patient who has a staphylococcal infection. This requires the highest degree of skill and knowledge on the part of the clinician to diagnose the disease properly, to interpret the tests run by the supporting laboratory, to choose the proper antibiotic from among the number at hand today, and to administer it properly. When the clinician is not sufficiently familiar with this area, he should not hesitate to call for advice.

A Reporting System

Infections cannot be controlled unless we know that they are there. This requires reporting of staphylococcal infections by certain responsible parties within each hospital. The initial report has been made in different hospitals by house officers, nurses, or personnel in the hospital laboratory. Different methods may be feasible for different hospitals. Whichever one is used, the reports should go to an infections committee, which should be set up in each hospital. Such a committee should be

broad in its interest, representative in its personnel, and of sufficient authority to make sure that its suggestions will be carried out.

Reporting should be amplified by checkups of susceptible groups, such as newborns, after they have left the hospital. Several feasible methods were suggested for these surveys. Most important is that they have the full cooperation of the hospitals, of the medical profession, and of the health officer.

Reporting and control are not successful without proper definitions. Agreement could not be reached on any one system of classification of staphylococcal infections. Accordingly, it was suggested that the Public Health Service set up a committee to recommend a proper classification.

None of the measures for control will have any effect without continuous, interesting, and authoritative publicity. Educational programs are needed within the hospital for all the personnel from the lowest to the highest. These can be aided by health authorities and local and national medical associations by the provision of information, teaching aids, and speakers, and the initiation of communitywide meetings from time to time.

Finally, and most urgently, we need more research on staphylococci and the infections they cause. I have already mentioned some of the things we need to know. Funds are needed for intramural and extramural research on the practical problems of staphylococcal infections, their communicability and control, and especially on fundamental problems of host resistance to the staphylococcus and how it may be strengthened.

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lococci which are resistant to various antibiotics in different populations, and we know some of the factors that cause resistant strains to appear; we don't know how to prevent the appearance of such strains in hospitals (short of exposing no one at all to that particular antibiotic), and we don't know how to replace a resistant strain with a sensitive one.

We know that staphylococci are spread among patients and personnel of hospitals, that they may cause endemic infections in any hospitalized patients and epidemics chiefly among newborns and surgical patients. We don't know the most frequent pathways of spread, whether carriers or environmental sources are the most important, nor what makes epidemics start. We know that certain strains are more frequently encountered as epidemic strains; we don't know what causes them to become epidemic strains. We can often trace an epidemic to an infected person or carrier; we cannot tell why some other infected person or carrier did not start an epidemic. We know that the removal of a carrier or strict attention to aseptic techniques sometimes appears to stop an epidemic; we fear that these measures will not always do so.

We know some conditions that increase patients' susceptibility to staphylococcal infections, but do not know why some persons develop staphylococcal infections while others fail to do so under apparently identical circumstances. Finally, especially as a result of this conference, we don't know any cause for wild alarm and gnashing of teeth over the staphylococcal problem; we do know that there is an important and compelling job to be done which calls for rolling up our sleeves and getting to work.

Techniques of Control

How should we go about controlling staphylococcal infections? Since we cannot easily get rid of the staphylococci that are causing or may cause disease within a hospital, most recommendations in the discussions were directed at limiting their spread. The first barrier is at the entrance of the hospital or the ward. Perhaps some patients with staphylococcal infections could be better nursed at home. Hos-

pital personnel, from the chief of staff down, should not contact patients if the staff member has a staphylococcal skin lesion or is known to have produced infections in patients. During an epidemic in a critical area such as a nursery or an operating room, personnel may be removed if they are carrying the epidemic strain.

The second barrier is within the hospital, between personnel and patient or between patient and patient. The conferees unanimously recommended complete isolation of patients with staphylococcal infections, wherever practicable. They urged that careful techniques be observed in the performance of operations, along with the proper sterilization of instruments and apparatus, the proper technique in dressing wounds, careful disposal of discharges and sputum, the washing of hands after examining patients with infected lesions, and the removal of staphylococci from that susceptible animal, the newborn infant, by washing his skin with special preparations.

With regard to spread through the air or from objects in the environment, everyone recognized the need for more knowledge. We do not know enough about the importance of proper ventilation (except in the operating room and rooms for dressing wounds), of washing floors and walls, of sterilizing blankets, of spacing beds and cribs; we do not know the value of rooming-in procedures for infants and so on. It was emphasized again and again that there is no simple and easy panacea for the control of intrahospital staphylococcal infections. Many things must be done, some of which may be unnecessary; the wisest course is first to close the most likely pathways of spread of infection and proceed to the others if necessary. In the last extremity, nurseries or wards may be closed, and, almost everyone agreed, the operating room might have to be closed, too.

Antibiotics, which have no doubt been responsible for some of our trouble with the staphylococci, are of little help in getting us out of trouble. Their role in the prevention of infections is limited to certain specific situations. There is no evidence that they will prevent staphylococcal infections from developing in hospitalized patients except perhaps

26 infants infected with the epidemic phage type 80/81 during a nursery outbreak (4). During 5 months of observation about three-fourths of the mothers and one-third of the fathers and siblings were shown to be carrying phage type 80/81 in their nasopharynx on one or more occasions. Eleven of the 26 families were still infected at the end of the study. A variety of skin infections and subcutaneous abscesses occurred in about 40 percent of the infected mothers and fathers and 70 percent of infected siblings. Shaffer and associates have reported similar findings (5). At the end of the 18 months of his study, 9 of 20 families were still infected.

These investigations have provided convincing evidence that epidemic strains of staphylococci carried by infants at discharge are rather readily transmitted to family members, persist for long periods within the family, and are responsible for endemic staphylococcal disease within the family unit.

Further evidence that the nursery epidemics may result in an increased incidence of community disease has been provided by a comparison of families of infants born during epidemic and nonepidemic periods in the same hospital. In one recent study, investigations were made of 1,076 families of infants born during a nursery epidemic of 3 months' duration and 211 families of infants born during a nonepidemic period (6). In 25 percent of the families of epidemic infants one or more members of the family group had developed staphylococcal disease 1 to 5 months following the birth of the baby, while 3 percent of families of nonepidemic infants gave a similar history. Eleven percent of 3,975 family contacts developed disease during the epidemic period, while 0.8 percent of 506 family members developed a similar illness during the nonepidemic period. If an infection rate of about 1 percent is accepted as a rough approximation of the level of endemic community disease during this period, then the difference between this and a rate of 11 percent is an approximation of the magnitude of increase in community infection which resulted from the nursery epidemic.

If the magnitudes expressed here are reasonably accurate and representative, it follows that

a significant increase in the level of community staphylococcal disease will follow uncontrolled type-specific nursery outbreaks. We are unaware of systematic studies of the transmission of epidemic strains from these hospital-associated families into the general community, but fragmentary evidence suggests this to be the case. Certainly the persistence of the strains within the family unit for such long periods make it likely that transmission to friends and relatives will eventually occur. In this event the "crude equilibrium between the public at large and the ubiquitous staphylococci" referred to by McDermott as appearing relatively stable in 1956 (7) might well be shifted in favor of the staphylococcus and result in an absolute increase in the level of endemic community disease.

It is difficult for one who has not observed family staphylococcal disease to be impressed with the seriousness of the situation. We observed one family whose infant was born in October 1954 in a nursery during an epidemic caused by phage type 80/81. The infant developed a few blebs prior to discharge and severe staphylococcal impetigo after he went home. Since then this family has virtually never been without staphylococcal disease in 1 or more of its 5 members. The father and 1 of the 3 children have been hospitalized for incision and drainage of abscesses. The two other children and the mother have had incision and drainage as outpatients. On three different occasions the entire family has been treated with antibiotics in an attempt to eradicate the family infection. It is conservatively estimated that the cost in antibiotics and medical care, exclusive of hospitalization, has been well in excess of \$1,500. Type 80/81 has been repeatedly isolated from the nasopharynx and lesions of these individuals and was last isolated in July 1958, nearly 4 years after the epidemic.

The history of another family has been related to us by their private physician. He has been attempting to eradicate type 80/81 from this family for well over a year. In this case there had been no recent direct hospital contact. Two siblings had vacationed for a month with an uncle who had been having recurrent boils and carbuncles for a year, his problem

Hospital-Acquired Staphylococcal Disease and the Community

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HOSPITALS provide vitally needed services to practitioners of medicine and to the community at large. Anything which tends to disrupt hospital services or interfere in any way with their optimal function is of real concern to the community. Hospital-acquired staphylococcal disease can certainly decrease the efficiency of hospital operation by prolonging the patient's hospital stay, increasing the cost of medical care, and, in some cases, jeopardizing the patient's recovery. The community and community agencies may be expected for these reasons to be vitally interested in the control of the problem.

Recent studies of the epidemiology of hospital-acquired staphylococcal infections have established additional reasons for concern. It is now very clear that the hospital with an uncontrolled staphylococcal disease problem may act as a focus of infection for the community itself. It is also clear that many patients infected while in the hospital do not develop overt disease until some time following their discharge and thus the detection of the disease in the community becomes essential to the delineation of the hospital problem and its control. Evidence supporting these concepts is at the

moment most convincing in the case of strain-specific staphylococcal infections acquired in hospital nurseries.

Two outstanding features of the epidemiology of nursery outbreaks have been the number of infants who develop the first signs of disease following discharge from the hospital and the frequency of postpartum breast abscess among mothers. Studies on the nasal flora of women on admission to the maternity service and at the time of discharge, as well as that of their infants, indicate the infants (1) are the source of the staphylococcus responsible for the breast abscesses. These studies also demonstrated that in the vast majority of cases transmission from infant to mother takes place in the home. These findings suggested the possibility of simultaneous or subsequent transmission to other members of the family and the establishment of endemic staphylococcal disease within the family group.

Colbeck, while studying nursery outbreaks in Winnipeg in 1949, found this to be the case (2). In the families of 10 infants born in an epidemic period, he demonstrated recurrent suppurative disease among family members during several months following the discharge of the infant and mother from the hospital. Staphylococci isolated from the lesions in family members appeared to be of the same phage type as that responsible for the nursery outbreak. In 1953 Kempe, reporting the family as a reservoir of childhood infections, includes an excellent description of family staphylococcal disease persisting over a 9-week period (3). More recently we have studied the families of

Dr. Wentworth is medical coordinator of disease control activities in the Ohio Department of Health, where Mrs. Miller is a communicable disease nursing consultant and Mrs. Wentworth is head of the research laboratory. The paper was presented at the National Conference on Hospital-Acquired Staphylococcal Disease in Atlanta, Ga., September 16, 1958.

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Nursing Opportunities in the Public Health Service

Staff nurses, head nurses, and supervisors are employed in 16 major Public Health Service hospitals in the United States and in 55 Public Health Service Indian and Alaska native hospitals. Clinical nurses are also employed in the Clinical Center, the Service's 500-bed research hospital at the National Institutes of Health. Twelve of the 16 hospitals provide general medical and surgical services; 1 is exclusively for tuberculosis cases; 2 are for treatment of narcotic addiction and other neuropsychiatric disorders; and 1 is the only hospital in continental United States devoted exclusively to care of leprosy patients. There are opportunities for teaching and training at all levels.

Total bed capacity of the 16 major hospitals in the United States ranges from 135 to 1,250 beds; the total capacity in the Indian and Alaska native hospitals is about 3,800, with bed capacity per hospital ranging up to 400.

In the field of public health nursing, opportunities are available in epidemiological investigations and studies, in public health activities in the Indian health program, in general and special public health programs (such as heart disease control, tuberculosis control, venereal disease control, and quarantine activities), and in technical assistance programs overseas.

Entrance salaries for Public Health Service professional nurses were recently raised by 10 percent. They now range from \$4,040 a year for GS-5 beginners (formerly \$3,670) to \$9,890 for GS-13 program heads (formerly \$8,990). For nurses with a year of experience, the new rate is \$4,490 a year (formerly \$4,080).

Further information on nursing opportunities may be obtained by writing to the Surgeon General, U. S. Public Health Service (P), Washington 25, D. C.

having started shortly after he was discharged from the hospital following elective surgery. The 80/81 strain was isolated from his lesions, and the hospital in which he had surgery was found to have a staphylococcal disease problem.

Although not representative, these cases illustrate the extent to which infection may become a serious problem for the family and point up the very great difficulties of eradicating the infection from the family group. Treating the family as a unit with an appropriate antibiotic appears to be effective in some instances, but by and large results in failure. According to a personal communication in 1958, Colbeck has had some encouraging results following thorough disinfection of the household. It is probably fair to state, however, that at the moment there is no really satisfactory approach to the eradication of the epidemic strains from the family and that, in a good percentage of the cases, staphylococcal disease may be expected to recur over long periods despite repeated attempts at eradication.

These findings certainly underline the importance of controlling nursery outbreaks. In addition, they have certain practical implications. During nursery epidemics it is not unusual for the majority of infants to develop their disease following discharge from the hospital. The number of cases of frank disease occurring in the nursery are frequently below the threshold of recognition. Unless the infants developing postdischarge disease are properly diagnosed and reported back to the hospital, an epidemic situation may continue undetected for long periods. This implies that the prompt detection and control of hospital epidemics requires the cooperation of individuals and agencies outside the hospital. The adequate provision of laboratory services, a reporting system, and survey techniques for the detection of lesions unattended or unreported by physicians are essential to the control of the hospital situation. With respect to nursery outbreaks, then, the universe of concern clearly extends beyond the hospital walls and includes the entire community of which the hospital is a part.

Whether these findings apply to the post-surgical infections of the hospital-infected adult medical patient is less clear. It has been

shown repeatedly that hospital patients acquire antibiotic resistant strains of staphylococci during their hospital stay and are carrying them on their skin or mucous membranes at the time of discharge (8, 9). Some degree of transmission to family members of nonepidemic "hospital strains" resistant to antibiotics has been demonstrated (8), but the seriousness of a potential increase in the endemic level of community staphylococcal disease needs further exploration. Infections with antibiotic resistant strains certainly present more difficult therapeutic problems and appear to be resulting in a higher case fatality rate than infections with sensitive strains (10, 11). As the hospital is a primary community source of antibiotic resistant staphylococci, hospital-acquired staphylococcal infections are a threat to the community. While the role of official public health agencies and an organized community in the detection and control of these infections is less clear than in the case of nursery disease, the need for community interest and awareness and the responsibility of community agencies for the provision of service to assist the hospital is surely as great.

In summary, it would appear fair to state that hospital-acquired staphylococcal disease is a hazard to the community because it threatens the efficiency of hospital operation and because, at least in the case of type-specific nursery disease, acts as a focus for a serious increase in the level of community-acquired staphylococcal disease. In addition, it is likely that hospital epidemics may go undetected unless the hospital-acquired disease occurring after discharge is promptly found and brought to the attention of the hospital. Organized community effort to provide epidemiological and laboratory services, the prompt reporting and analysis of incidence data, and surveys for hospital-associated morbidity undetected by other means are essential to the control of hospital epidemics.

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Table 1. Brucellosis in humans, Minnesota, 1927-56

| Year | Cases ¹ | Deaths ¹ | Population ² (in millions) | Case rates per 100,000 |
|-----------|--------------------|---------------------|---------------------------------------|------------------------|
| 1927----- | 6 | 0 | 2.51 | 0.24 |
| 1928----- | 12 | 0 | 2.53 | .47 |
| 1929----- | 42 | 0 | 2.55 | 1.64 |
| 1930----- | 62 | 0 | 2.56 | 2.42 |
| 1931----- | 72 | 2 | 2.59 | 2.78 |
| 1932----- | 62 | 3 | 2.61 | 2.38 |
| 1933----- | 72 | 0 | 2.63 | 2.74 |
| 1934----- | 102 | 1 | 2.66 | 3.83 |
| 1935----- | 114 | 3 | 2.68 | 4.25 |
| 1936----- | 77 | 2 | 2.70 | 2.85 |
| 1937----- | 89 | 5 | 2.72 | 3.27 |
| 1938----- | 85 | 0 | 2.75 | 3.09 |
| 1939----- | 92 | 3 | 2.77 | 3.32 |
| 1940----- | 137 | 3 | 2.79 | 4.91 |
| 1941----- | 177 | 1 | 2.81 | 6.29 |
| 1942----- | 260 | 1 | 2.83 | 9.18 |
| 1943----- | 326 | 1 | 2.85 | 11.43 |
| 1944----- | 395 | 0 | 2.87 | 13.76 |
| 1945----- | 352 | 1 | 2.89 | 12.17 |
| 1946----- | 403 | 1 | 2.91 | 13.84 |
| 1947----- | 378 | 0 | 2.93 | 12.90 |
| 1948----- | 295 | 1 | 2.94 | 10.03 |
| 1949----- | 349 | 0 | 2.96 | 11.79 |
| 1950----- | 281 | 0 | 2.98 | 9.42 |
| 1951----- | 188 | 1 | 3.02 | 6.22 |
| 1952----- | 135 | 0 | 3.07 | 4.39 |
| 1953----- | 131 | 1 | 3.11 | 4.21 |
| 1954----- | 149 | 0 | 3.15 | 4.73 |
| 1955----- | 114 | 0 | 3.19 | 3.57 |
| 1956----- | 63 | 0 | 3.25 | 1.94 |

¹ From records of the Minnesota Department of Health.

² Population figures between censuses were interpolated.

lation of all cattle reacting to tests and regulates the importation of any cattle into the area according to whether the animals, or herds from which they originate, are infected or not. By 1956 all the counties in the State were operating under this plan.

The area plan of control, as it is operated in Minnesota, has been successful. There has been a steady increase in the number of counties that have attained a certified status, except during World War II and the immediate post-war period when progress in eradication nearly came to a standstill.

More important, perhaps, is that the testing for recertification at the intervals required by State law and the Uniform Methods and Rules

of the U. S. Department of Agriculture continues to show a decrease in the incidence of brucellosis in cattle. This favorable progress is probably attributable to the Minnesota law and regulations that provide for the blood agglutination test of all cattle as the basis of the eradication program. The milk ring test and calfhood vaccination, while used extensively, are considered only as supplements to the systematic blood testing of all cattle.

Effects of Program

Figures 1-4 compare the number of cattle (taken from the U. S. Department of Agriculture's official estimates of all cattle and calves on farms on January 1 of each year) with the number of human cases of brucellosis, the percentage of counties under the area certification program, and the number of cattle reactors to brucellosis which were slaughtered. From these figures it can be seen that from 1927 to 1948 when numbers of cattle increased or decreased, there was usually a corresponding increase or decrease in the number of human cases of brucellosis. From 1949 to 1956, however, this relationship was no longer evident.

It is apparent from the data in the figures that the area control program was effective in reducing human cases of brucellosis. During 1949-50 the number of counties joining the area test program began to increase sharply. The years 1949-51 were the beginning of a rise to new heights of the cattle population and the number of cattle reactors slaughtered. Concurrent with these upward trends there was a marked downward trend in the number of reported human cases of brucellosis.

Table 2 shows the number of counties certified year by year in Minnesota and the case rates in the certified counties as contrasted with those in the noncertified counties. The life table approach has been used in preparing this table.

The total experience shows that since 1940, when the first counties were certified, the case rate has been 3.12 times greater in noncertified than in certified counties.

Each year since 1942, except 1955 and 1956, the case rates have been significantly higher in noncertified counties. In 1955 and 1956, how-

Coincident with progress in the eradication of brucellosis in Minnesota's cattle, the number of human cases have significantly decreased.

Effect of Eradicating Brucellosis in Cattle on Incidence of Human Cases

JOE R. HELD, D.V.M., HENRY BAUER, Ph.D., and RALPH L. WEST, D.V.M.

BRUCELLOSIS was first reported in humans in Minnesota in 1927, and there was a general trend toward an increasing number of cases until 1946. Since 1946, however, the trend has been downward. Whereas the case rate per 100,000 population was 0.24 in 1927, it was 1.94 in 1956. The maximum case rate of 13.84 occurred in 1946 (table 1). The purpose of this study is to show the effect of the area certification program on this rise and fall in the reported number of human cases of brucellosis.

One can assume that, as with any disease, an awareness of the disease's presence in the State was needed before the majority of cases could be diagnosed properly as brucellosis. In 1927, serologic and bacteriological services were introduced into the laboratories of the Minnesota Department of Health to aid in the diagnosis of brucellosis. These services were accepted

by practicing physicians and have been used increasingly since that time.

It should be noted here that the only cases counted by the Minnesota Department of Health are those confirmed by an agglutination test with a titer of at least 1:80, accompanied by clinical symptoms suggestive of brucellosis, or confirmed by isolation of the organism from blood cultures.

Other factors undoubtedly affecting the number of human cases of brucellosis in Minnesota are the number of cattle in the State and the extent of the area certification program pertaining to brucellosis in cattle.

Statewide pasteurization of milk may also have played a role in decreasing the incidence of infection in humans. A law requiring pasteurization was enacted in 1949, and a regulation prescribing minimum standards for grade A milk became effective under that law on March 31, 1952. No attempt will be made in this paper to evaluate the effect of pasteurization in itself, since for our purposes the presence of *Brucella* organisms in milk merely signifies an infected animal.

In 1939 the Minnesota Legislature enacted a law authorizing the State Livestock Sanitary Board to control and eradicate brucellosis in cattle by means of an area plan. Under this plan, all cattle owners in a specified area are required to participate in a testing program. The law also provides for the slaughter or iso-

Dr. Held, assistant veterinarian, Communicable Disease Center Activities, Public Health Service, at the time of this study, is taking graduate work in public health at Tulane University. Dr. Bauer is director, division of medical laboratories, Minnesota Department of Health. Dr. West is secretary and executive officer, Minnesota State Livestock Sanitary Board. Dr. Herman Kleinman, chief, section of chronic diseases, Minnesota Department of Health, assisted in the statistical analysis of the data.

Table 2. Total human case rates of brucellosis in certified and noncertified counties, Minnesota, 1937-56

| Year | Number of certified counties by end of year ¹ | Number of non-certified counties by end of year ¹ | Person-years risk in certified counties (in millions) ² | Person-years risk in non-certified counties (in millions) ³ | All cases in certified counties ⁴ | All cases in non-certified counties ⁴ | Case rates in certified counties ⁵ | Case rates in non-certified counties ⁵ | Ratio of certified CR to non-certified CR |
|-------|--|--|--|--|--|--|---|---|---|
| 1937 | 0 | 87 | | 2. 7923 | | 89 | | 3. 19 | |
| 1938 | 0 | 87 | | 2. 7923 | | 85 | | 3. 04 | |
| 1939 | 0 | 87 | | 2. 7923 | | 92 | | 3. 30 | |
| 1940 | 7 | 80 | 0. 0563 | 2. 7360 | 1 | 136 | 1. 78 | 4. 97 | 1:2. 79 |
| 1941 | 13 | 74 | . 1617 | 2. 6306 | 5 | 172 | 3. 09 | 6. 54 | 1:2. 12 |
| 1942 | 20 | 67 | . 3635 | 2. 4288 | 13 | 247 | 3. 58 | 10. 17 | 1:2. 84 |
| 1943 | 21 | 66 | . 5251 | 2. 2672 | 15 | 311 | 2. 86 | 13. 72 | 1:4. 80 |
| 1944 | 22 | 65 | . 5491 | 2. 2432 | 22 | 373 | 4. 01 | 16. 63 | 1:4. 15 |
| 1945 | 22 | 65 | . 5491 | 2. 2432 | 24 | 328 | 4. 37 | 14. 62 | 1:3. 35 |
| 1946 | 22 | 65 | . 5491 | 2. 2432 | 18 | 385 | 3. 28 | 17. 16 | 1:5. 23 |
| 1947 | 22 | 65 | . 5491 | 2. 2432 | 22 | 356 | 4. 01 | 15. 87 | 1:3. 96 |
| 1948 | 22 | 65 | . 5491 | 2. 2432 | 18 | 277 | 3. 28 | 12. 35 | 1:3. 77 |
| 1949 | 22 | 65 | . 5491 | 2. 2432 | 33 | 316 | 6. 01 | 14. 09 | 1:2. 34 |
| 1950 | 23 | 64 | . 5595 | 2. 4229 | 9 | 272 | 1. 61 | 11. 23 | 1:6. 98 |
| 1951 | 24 | 63 | . 5691 | 2. 4133 | 15 | 173 | 2. 64 | 7. 17 | 1:2. 72 |
| 1952 | 26 | 61 | . 5903 | 2. 3921 | 7 | 128 | 1. 19 | 5. 35 | 1:4. 50 |
| 1953 | 29 | 58 | . 6280 | 2. 3544 | 11 | 120 | 1. 75 | 5. 10 | 1:2. 91 |
| 1954 | 35 | 52 | . 7204 | 2. 2620 | 10 | 139 | 1. 39 | 6. 15 | 1:4. 42 |
| 1955 | 54 | 33 | 1. 1775 | 1. 8049 | 65 | 49 | 5. 52 | 2. 72 | 2. 03:1 |
| 1956 | 78 | 9 | 1. 8386 | 1. 1438 | 45 | 18 | 2. 45 | 1. 57 | 1. 56:1 |
| Total | | | 10. 4846 | 38. 3152 | 333 | 3, 800 | 3. 18 | 9. 92 | 1:3. 12 |

¹ From records of the Minnesota Livestock Sanitary Board.

² Based on the formula: person-years at risk=population in certified counties previous year plus one-half the added certified population.

³ Total population minus the person-years at risk in certified counties during the current year.

⁴ From records of the Minnesota State Department of Health.

⁵ Based on the formula: CR=cases×100,000÷person-years at risk.

Table 3. Blood cultures positive for *Brucella* in humans, Minnesota, 1932-56 ¹

| Year | <i>B. abortus</i> | <i>B. suis</i> | <i>B. melitensis</i> | <i>B. melitensis</i> or <i>suis</i> ² | Year | <i>B. abortus</i> | <i>B. suis</i> | <i>B. melitensis</i> | <i>B. melitensis</i> or <i>suis</i> ² |
|------|-------------------|----------------|----------------------|--|------|-------------------|----------------|----------------------|--|
| 1932 | 13 | | | 0 | 1946 | 98 | 6 | 4 | |
| 1933 | 6 | | | 0 | 1947 | 71 | 6 | 7 | |
| 1934 | 2 | | | 0 | 1948 | 62 | 0 | 5 | |
| 1935 | 9 | | | 0 | 1949 | 41 | 4 | 17 | |
| | | | | | 1950 | 22 | 8 | 4 | |
| 1936 | 4 | | | 1 | | | | | |
| 1937 | 1 | | | 0 | 1951 | 23 | 8 | 1 | |
| 1938 | 1 | | | 1 | 1952 | 17 | 10 | 1 | |
| 1939 | 1 | | | 3 | 1953 | 21 | 6 | 0 | |
| 1940 | 31 | | | 7 | 1954 | 25 | 2 | 0 | |
| | | | | | 1955 | 20 | 0 | 0 | |
| 1941 | | | | 2 | | | | | |
| 1942 | 34 | | | 9 | 1956 | 6 | 1 | 2 | |
| 1943 | 22 | | | 11 | | | | | |
| 1944 | 33 | | | 20 | | | | | |
| 1945 | 51 | | | | | | | | |
| | 65 | 8 | 9 | | | | | | |

¹ From the records of the Minnesota Department of Health. Cultures were not made prior to 1932.

² Prior to 1945 dye test plates were not used, and further identification of these two species was not made.

ever, there was a great shift in the population from a noncertified to a certified status. This fact, coupled with the incubation period of brucellosis and the difficulties that sometimes arise in establishing a diagnosis, probably contributes to creating a lag effect, so that cases that actually occurred under noncertified conditions are being reported after the area has become certified. The difference in case rates in 1956 is not statistically significant, which tends to uphold this hypothesis.

Brucellosis in Humans From Cattle

The question may arise as to whether or not the real problem of brucellosis in humans in Minnesota originates from contact with cat-

Figure 1. Number of cattle on farms, Minnesota, 1927-56.

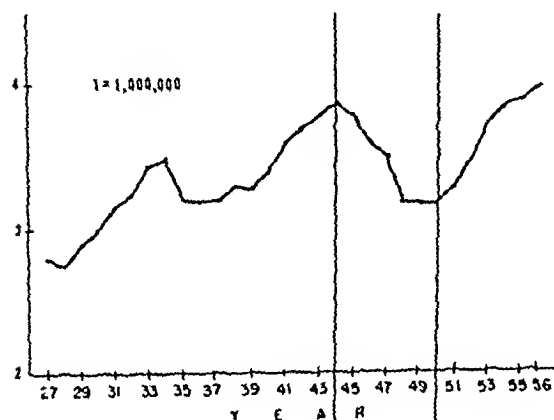
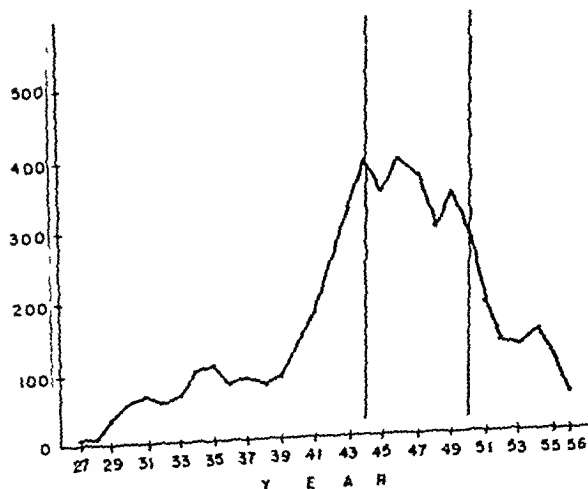


Figure 2. Reported number of human cases of brucellosis, Minnesota, 1927-56.



tle. In addition to blood samples submitted routinely for *Brucella* culture, the division of medical laboratories of the Minnesota Department of Health attempts to obtain blood specimens for all individuals who show a *Brucella* antibody titer of 1:320 or higher. Of course, by the time arrangements are made to have blood submitted for culture, the patient is not always in that stage of the disease where there is bacteremia.

Figure 3. Number of Minnesota cattle reactors to brucellosis slaughtered, 1937-56.

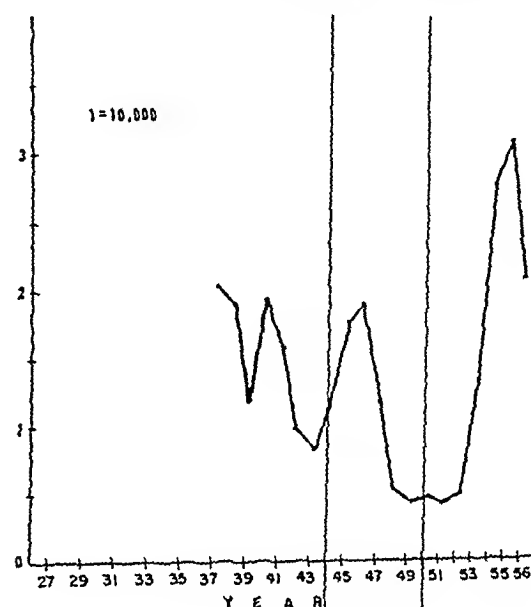
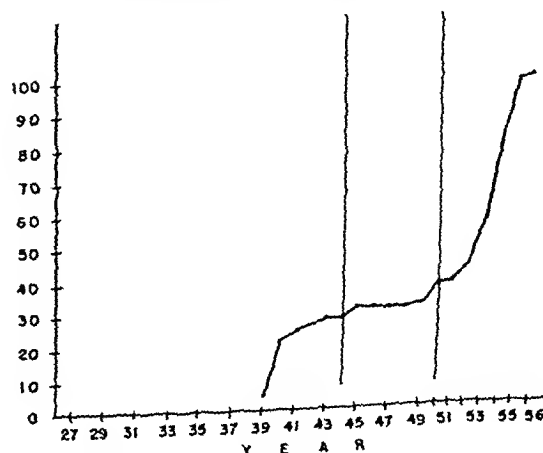


Figure 4. Percentage of counties under the area control program for brucellosis in cattle, Minnesota, 1939-56.



*With the northward movement of yellow fever, the Public Health Service is intensifying its program for control of *Aedes aegypti*, particularly in international traffic zones of the yellow fever receptive area of the United States.*

Measures Against Yellow Fever Entry Into the United States

JOHN H. HUGHES, Ph.D., and JOHN E. PORTER, Ph.D.

THE SURGEON GENERAL of the Public Health Service is authorized by the Public Health Service Act to make and enforce regulations for preventing the introduction of diseases of man into the United States and their spread in this country. The Division of Foreign Quarantine has the responsibility for preventing the importation of disease. This responsibility requires enforcement of quarantine regulations applicable to all traffic arriving by air, sea, or land.

Although there are other important diseases affecting man, the Public Health Service foreign quarantine regulations place particular emphasis on smallpox, cholera, plague, louse-borne relapsing fever, louseborne typhus, and yellow fever. These diseases are recognized by the World Health Organization and by the health departments of many countries as the six quarantinable diseases. Five of them involve insects in their transmission and therefore are of particular interest to entomologists.

There are a number of entomological problems in quarantine operations, but at this time particular consideration will be given to the detection and control of *Aedes aegypti* Linn. at airports, in dock areas of seaports, and at land-entry points. *A. aegypti* has played an important role in the transmission of yellow fever in many countries around the world, and it is the only widely distributed mosquito in the

United States that is known to be a natural transmitter of the yellow fever virus.

However, *Haemagogus equinus*, a species of mosquito found naturally infected with yellow fever in Guatemala (1), occurs near Brownsville, Tex., in limited numbers. This forest-type mosquito was collected in the Brownsville area in 1955 by Trapido and Galindo (2), who found it in tree holes of thorn scrub; in 1957, by Eads and Strom (3), who found it in water in tree holes of Texas ebony, *Pithecolobium flexicaule*; and by Strom (unpublished record). Breland reported *H. equinus* from cavities in the Texas ebony and from a hackberry tree (4). This interesting addition to the mosquito fauna of the United States has a range extending southward from the Brownsville area to Colombia, South America, and is the only representative of the genus *Haemagogus* reported in the United States.

Historical Note

Historically, yellow fever in its urban form has occurred on numerous occasions in epidemic

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The isolations that are made, however, represent a random sampling of all reported cases. Table 3 gives the number and type of *Brucella* organisms isolated from blood cultures for the period 1932 to 1956. From this information it can be seen that the majority of patients were infected with *Brucella abortus*. Since it is known that in animals *B. abortus* is mainly found in cattle, it seems safe to assume that the majority of human cases in Minnesota resulted from contact with cattle.

Summary

Coincident with progress in the eradication of brucellosis in cattle, there has been a signifi-

cant reduction in the number of human cases.

From 1927 to 1948, when the number of cattle increased or decreased, there was a corresponding increase or decrease in the number of human cases of brucellosis in Minnesota. But from 1950 to 1956 the number of human cases declined markedly in spite of a high increase in the cattle population. This change in trend results from the elimination of some sources of human infection by the acceleration of the program for eradicating the disease in cattle.

Since 1940, when the first counties were certified as brucellosis free, the total experience has shown that the human case rate for brucellosis has been 3.12 times greater in noncertified areas than in certified areas.

Infant Care

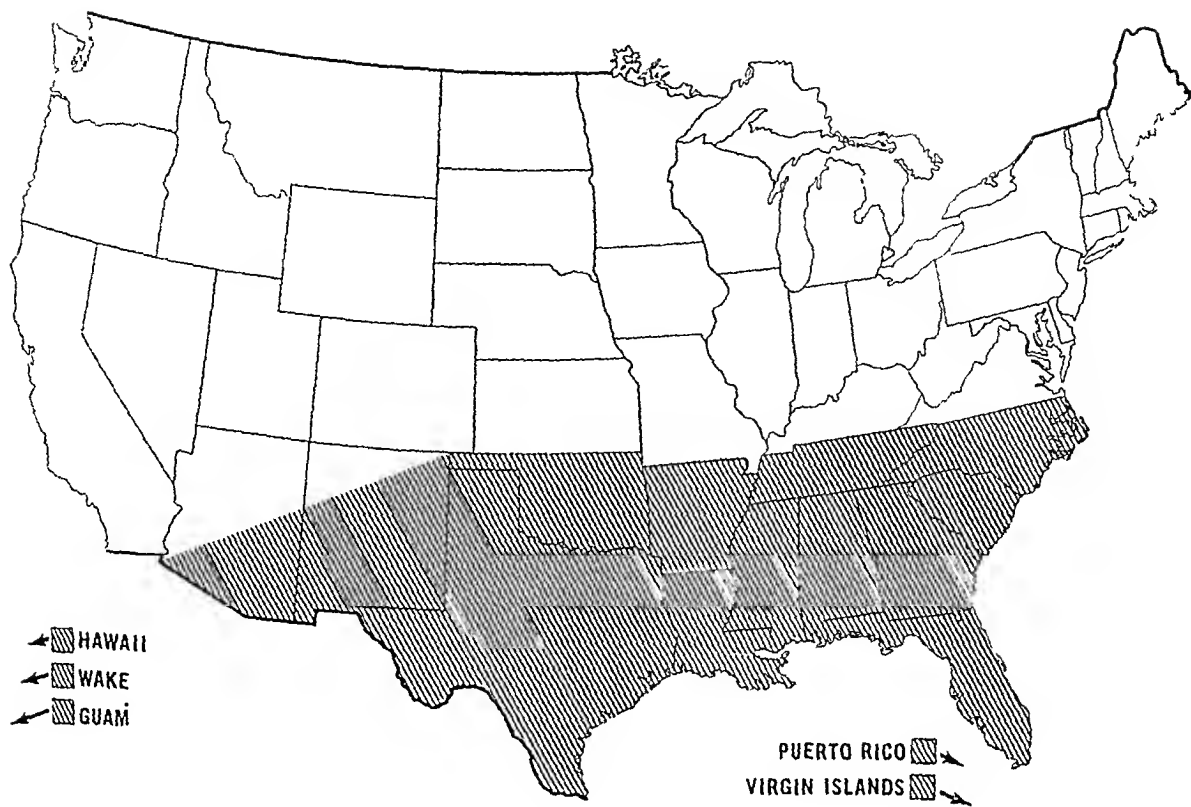
The booklet *Infant Care* first published in 1914, soon after the establishment of the Children's Bureau, is now in its 10th edition. In addition to 40 million copies sold in this country, it has been translated and widely distributed abroad.

The 10 editions reflect the history of child care practices in the United States. In 1914, for example, fathers were advised not to play with an infant son or daughter because it might result in "nervous disturbances of the baby and upset his regular habits." Experts now agree that infants need the attention of their fathers as well as their mothers.

In 1914 *Infant Care* did not advise even strained fruits until a baby was 7 or 8 months old, and solid foods were not recommended until after a baby was 1 year old. Today's *Infant Care* baby gets fruit juice at 2 weeks and solid foods within the first few months of his life.

The Children's Bureau is planning the 11th revision of *Infant Care*. As in the past, the Bureau will have the advice of a technical advisory committee, composed of physicians who represent four major medical societies, and the guidance of parents, psychologists, nurses, nutritionists, anthropologists, social workers, parent educators, and others.

Yellow fever receptive area in the United States.



yellow fever receptive area (see map) the incidence of *A. aegypti* is considered sufficiently high to support yellow fever transmission, particularly during the warm months of the year. The delineated area will be modified as may be necessary to reflect changes in the distribution pattern of the mosquito.

Preventing Entry Into the U. S.

The United States has a human population which presumably is not immune to yellow fever; it has a widespread distribution of a mosquito vector of the disease; and it has a history of outbreaks of the disease. Also, the disease is present in areas comparatively close to our possessions in the Caribbean area and to our southern ports and land-entry points. Furthermore, modern rapid transportation makes it possible for persons in the incubation stage of the disease and infected mosquitoes, monkeys, or other animals to bring in the yellow fever virus from countries where it now occurs.

Although the last outbreak of yellow fever in this country occurred more than half a century ago, and no cases of the disease have been reported on ships or other conveyances arriving at United States ports for more than 30 years, we cannot be assured of its continued absence from this country.

Activities directed toward preventing the introduction of yellow fever into the United States are being carried on at various ports of entry as a part of a broad quarantine program. These include:

- Requirement of a valid yellow fever vaccination certificate of any traveler from a yellow fever area who arrives in or is destined for the yellow fever receptive area within the incubation period of the disease.

- Medical examination of persons arriving from yellow fever areas and, if necessary, their surveillance or isolation.

- Inspection of monkeys and certain other primates coming from yellow fever areas, and requirement of immunization against the disease or retention in a mosquito-proof crate or

proportions in the United States. The last epidemic in this country occurred during the period July to December 1905, with 8,399 cases and 908 deaths (5).

Twenty-six cases of yellow fever, exclusive of laboratory cases such as those reported by Berry and Kitchen for the period 1929-31 (6), have been reported in the United States since the 1905 epidemic. Twenty-three of these were intercepted on ships in international traffic which arrived at Public Health Service quarantine stations. These cases are reported in the annual reports of the Public Health Service as follows:

| Fiscal year | Cases | Deaths |
|-------------|----------------|--------|
| 1907..... | 6 | 1 |
| 1908..... | 3 | 3 |
| 1911..... | 1 | 0 |
| 1912..... | 1 | 0 |
| 1913..... | 1 | 0 |
| 1917..... | 2 | 0 |
| 1922..... | 5 | 0 |
| 1923..... | 3 | 0 |
| 1924..... | 1 ¹ | 0 |

¹ Suspected.

In addition, one case of unknown origin occurred in New Iberia, La., in August 1906; another occurred in Honolulu during October 1911 in a quarantine station employee who was detailed as a guard on a vessel on which a case of yellow fever was present; and an immigrant from Mexico was reported to have died of yellow fever in Houston, Tex., October 8, 1924 (7).

Northward Movement

One of the current problems facing the Public Health Service and other health agencies and involving entomology and related disciplines is the northward movement of yellow fever in the Americas. This disease was reported in both its urban and sylvan forms in Trinidad, B. W. I., in 1954 (8, 9) and in its sylvan form in various countries of Central America following its appearance in the Pacora area of eastern Panama in 1948. Human cases of sylvan yellow fever occurred in Panama during the period 1948 to 1952, in Costa Rica in 1951 and 1952, in Nicaragua in 1952, 1953, and 1954, and in Honduras in 1954 (10). According to the Weekly Epidemiological Reports of the Pan American Sanitary Bureau, in Panama the disease was again detected in man in 1956 and 1957, and

human cases were reported in Guatemala in 1957. Also, as reported in the Weekly Epidemiological Reports, sylvan yellow fever occurred in the simian population in the forested areas of the countries enumerated, and in 1957 the disease in monkeys was found in British Honduras.

The yellow fever virus was isolated from naturally infected *Haemagogus mesodentatus* K. and K., *Haemagogus equinus* Theob., and *Sabethes chloropterus* Humboldt collected in Guatemala in 1956 (1), and from *Haemagogus lucifer* (H. D. and K.) collected in Panama in 1957 (11), thus adding substantially to the list of known and potential transmitters of the yellow fever virus in nature. Sylvan yellow fever, as reported in the Weekly Epidemiological Reports, has occurred in all countries of Central America except El Salvador. Thus, only Mexico separates the continental United States from the Central American countries where yellow fever is known to occur.

Receptive Areas

Under the terms of the World Health Organization International Sanitary Regulations now in force (12), areas in which the virus of yellow fever does not occur, but in which *A. aegypti* or any other domiciliary or peridomestic vector of yellow fever is to be found under conditions that would permit development of the virus in the event of its introduction, are considered receptive to this disease and must be so declared. Thus, the area of the United States, including insular Territories and possessions, where *A. aegypti* occurs constitutes our yellow fever receptive area. Although yellow fever does not occur in this area, it might conceivably be introduced and become established, at least temporarily.

The yellow fever receptive area of the United States, as delineated by the Public Health Service and reported to the World Health Organization in 1953, in accord with article 70 of the International Sanitary Regulations, comprises 13 southern States, Puerto Rico and the Virgin Islands in the Caribbean area, and Hawaii and Wake Island in the Pacific area. Also, Guam has been added to this list, as reported in the Weekly Epidemiological Record of the World Health Organization, January 1958. In the

of Florida and Texas. During the period July 1957-June 1958, the Miami entomological unit made *A. aegypti* surveys in airports and dock areas in more than 25 localities in Florida, including Fort Pierce, Jacksonville, Miami, Pensacola, St. Petersburg, Tampa, and West Palm Beach. *A. aegypti* breeding was observed in 6 of the Florida airports inspected, with indexes as high as 4.0 percent. Breeding was also detected in 10 of the Florida docks inspected, with indexes as high as 9.0 percent. Outside Florida, similar surveys made during the spring of 1958 in a number of airports and dock areas along the Atlantic coast as far north as North Carolina revealed sparse breeding in one dock area in late June.

Most of the *A. aegypti* breeding was localized in overhaul and salvage areas of the airports inspected and was not observed in the active traffic areas. Comparable conditions existed in the dock areas. Control measures included application of DDT spray and, when feasible, removal or destruction of containers or making them unsuitable for supporting *A. aegypti* breeding. Port authorities and health officials in the area surveyed were apprised of the control problem and of results obtained in the surveys.

One finding of particular interest made by the Miami entomological unit was extensive *A. aegypti* breeding at the Key West, Fla., main city dock in water contained in old tires. This observation, made November 13, 1957, is particularly significant in view of the fact that this mosquito had not been reported on Key West since November 1948 (J. A. Mulrennan in personal communication, 1958). Although it is not known when or actually how *A. aegypti* returned to that island, continuous entomological surveillance is obviously necessary if costly and potentially dangerous health problems of this type are to be prevented.

During the early months of the program it has been possible to give only limited attention to the airport and dock areas in New Orleans with reference to *A. aegypti* breeding. However, no evidence of this mosquito has been found in the surveys. The program in this locality is being accelerated.

Negative results also were obtained in searches for *A. aegypti* at airports and in dock

areas of several port cities in Texas, including Brownsville, Houston, Galveston, and Corpus Christi, during the year ending June 30, 1958. Numerous potential *A. aegypti* breeding places were inspected and treated.

Outside the continental United States, emphasis is being placed on extension of the control program to international traffic areas in Hawaii, where the mosquito is present, although apparently in diminishing numbers, and in Puerto Rico and the Virgin Islands.

The current intensification of *A. aegypti* control activities by the Public Health Service should provide exact knowledge on which to base plans, not only for eradication of *A. aegypti* from the United States, but for a continuing quarantine program to prevent reintroduction of either the virus or the vector.

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other structure for a minimum of 9 days immediately before arrival in the yellow fever receptive area.

• Disinsectization of aircraft and ships and the entomological surveillance of airports and dock areas (13).

***Aedes aegypti* Control Programs**

For many years the control of *A. aegypti* and other mosquitoes has been an important part of the disease control program of the Public Health Service. During the latter years of yellow fever occurrence in this country, various sanitary measures, including mosquito control, often were employed on ships arriving at United States ports (14). With the advent of international aerial traffic, disinsectization measures were incorporated into the quarantine clearance requirements, particularly for aircraft arriving from foreign countries where yellow fever was prevalent. Supplemental to the disinsectization measures applied to aircraft and to some ships, an entomological surveillance and control program was put into operation and maintained at airports (15) and in dock areas having a southerly location and where international traffic is most active.

Prior to and during World War II the Public Health Service made other efforts to reduce the population of this mosquito in some of the major airport and seaport areas in the south. In the late 1930's the Division of Foreign Quarantine cooperated with certain counties in southern Florida in conducting mosquito abatement programs to reduce the *A. aegypti* population, particularly in areas of heavy international traffic. With the outbreak of hostilities the Service expanded these activities and, in collaboration with State health agencies, conducted a more extensive campaign in ports of entry in the south. These programs were directed toward reduction in the number of *A. aegypti*, as a means of protection against the introduction and establishment of yellow fever (16), and toward the training of available personnel, who could be called upon to assist in any part of the country, should yellow fever (or dengue) be introduced. Although the Public Health Service *A. aegypti* control program was discontinued after the close of World War

II, other, more limited programs have been conducted by local health departments.

In July 1957 the Public Health Service appropriation provided limited funds for the Division of Foreign Quarantine and the Communicable Disease Center to collaborate in investigations of *A. aegypti* control in the United States, including an evaluation of the threat of yellow fever in this country. These investigations should enable the United States to comply more fully with the terms of article 20 of the World Health Organization International Sanitary Regulations (12), which state, "Every port and the area within the perimeter of every airport shall be kept free from *Aedes aegypti* in its larval and adult stages."

The Division of Foreign Quarantine's portion of this broader and more comprehensive program consists of the establishment of entomological units at Miami, Fla., Brownsville, Tex., and New Orleans, La. These units will survey their respective base stations, and other areas as directed, to determine the presence and abundance of the yellow fever mosquito on various types of conveyances and at airports, dock areas of seaports, and border-crossing points in the yellow fever receptive area. Control measures and cleanup campaigns will be carried on in conjunction with the surveys. It is expected that some investigations and observations will be made with respect to possible insecticide resistance, survey and control techniques, biology and behavior of *A. aegypti*, and other aspects of prevention of importation of yellow fever.

The Communicable Disease Center will make surveys and otherwise obtain information to determine the distribution and abundance of the urban vector of yellow fever throughout the yellow fever receptive area and will carry on a project in a coastal city to ascertain costs and methods involved in eradication of *A. aegypti* in a specific urban area and the applicability of similar programs in other urban communities in the receptive area. As resources permit, CDC will make other field and laboratory investigations apropos of an *A. aegypti* and yellow fever control program.

The most active phase of the *A. aegypti* control program carried out by Division of Foreign Quarantine workers has been confined largely to the more important international traffic areas

Free Medical Care in Cities

SELMA MUSHKIN, Ph.D., and BEATRICE CROWTHER, B.A.

Approximately 7 percent of urban residents reported receipt of free medical services in 1950. Almost 4 of each 10 persons reporting receipt of some free services indicated they received physician services free; 1 of 5 reported hospital services; and another 1 of 5 reported laboratory tests, immunizations, or X-rays. More than 4 of each 10 persons reporting free care indicated they received free care in public hospitals or through public assistance or private voluntary agencies.

A larger proportion of persons spending \$500 or more out-of-pocket for medical services reported free care than of those spending smaller amounts for medical services. Almost 9 percent of persons 19-44 years of age reported free care as compared with 4 percent of the population under 6 years of age. About 1 of 8 urban household members hospitalized during 1950 reported some free hospital services.

ONE important financial aspect of medical services is the volume of free care provided for families by a multiplicity of public and private agencies. There is a paucity of data on the volume and relative importance of public and private aid in meeting medical care needs. In 1950, public expenditures for health and medical services aggregated about \$2.4 billion; and voluntary health and welfare agencies spent \$370 million (1).

Household surveys can provide only a partial picture of free care, for the types of medical services that are financed by private and public aid often include long-term institutional care, such as that given in mental hospitals, which removes the recipient from the household. Yet it is of interest to determine even in an incom-

plete way the numbers of persons receiving free care, the nature of this care, and the types of agencies providing it.

In view of the interest in this aspect of financing medical services, we processed data on free medical care reported in a subsample of family interviews. The information was gathered by the Bureau of Labor Statistics from 12,500 urban families in its survey of consumer expenditures in 1950. In all, 2,414 families and 7,639 persons were included in the subsample. The methods of sampling and weighting the subsample to estimate an urban aggregate have been presented in other articles (2, 3). The subsample included 50 percent of the families reporting no out-of-pocket medical care expenses, 10 percent of those reporting some medical expenses but in amounts less than \$200, 20 percent of those reporting \$200 to \$400, 50 percent of those reporting \$400 to \$1,000, and all families reporting medical expenditures of \$1,000 or more (see table 1).

Totals for each of the medical care expense classes were weighted to adjust for the subsample size within each of the nine geographic regions used by the Bureau of Labor Statistics for its sample weights. Each of the nine regions in turn was then weighted in accordance with the relative population of these regions as estimated by the Bureau of Labor Statistics.

Definition of Free Care

The Bureau of Labor Statistics interview included the following questions as part of its section on medical and personal care: Did any family member receive medical care free in 1950? If yes, about how much was it worth?

In the interview, information was asked

Dr. Mushkin is an economist and Miss Crowther is a research analyst; both are in the Division of Public Health Methods, Public Health Service.

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New PASB Appointments

Dr. Abraham Horwitz of Chile has been elected director of the Pan American Sanitary Bureau, regional office of the World Health Organization, succeeding Dr. Fred L. Soper, who will end his third term January 31, 1958.

The vote was taken October 1, 1958, in San Juan, Puerto Rico, at the Pan American Sanitary Conference, which is also the regional meeting for WHO members in this hemisphere. Dr. Horwitz's name will be presented to the WHO Executive Board in January 1959 for appointment.

The director-elect, who is on leave from his post as director of the School of Public Health of the University of Chile, is currently serving as assistant director of that country's National Health Service. He has been PASB consultant in training and education to various countries in the Americas. From 1952 to 1953 he was chief of the professional education branch at the regional office headquarters.

Dr. Horwitz received his doctorate of medicine from the University of Chile in 1936 and a master's degree in public health from Johns Hopkins University.

Harold R. Shipman has been appointed chief of the Pan American Sanitary Bureau's Branch of Environmental Sanitation.

Since he joined the World Health Organization's staff in 1952, Mr. Shipman has served in Turkey, Egypt, Austria, and the Americas. Previously, he was a sanitary engineer with the Minnesota Department of Health, the Farm Security Administration of the U. S. Department of Agriculture, and the American Red Cross in Korea.

Mr. Shipman holds a bachelor of science degree in chemical engineering and bacteriology and a master of science degree in sanitary engineering from the University of Minnesota. He is the author of various publications on sanitary engineering and is considered an authority on water supply and sewage disposal.



Veterans Administration hospitals and Public Health Service hospitals, (b) through research programs, (c) under workmen's compensation, (d) under arrangements paid by casualty insurance, such as automobile liability insurance, and (e) under public assistance programs.

The proportion of free hospital care indicated by the 1950 consumer expenditures survey is similar to findings of the Health Information Foundation. In its 1952-53 household survey, the foundation found that 1 or 2 percent of all families received only free hospital services (5).

The most frequent type of service received without charge was physician care. Of those reporting free service, 4 out of each 10 reported physician services outside of hospitals. Included among these services are those provided by physicians for members of their families, other relatives, employees, professional colleagues, and patients unable to pay, services in outpatient departments of hospitals, industrial implant medical services, and services provided for workmen's compensation cases. The persons reporting such services represented about 3 percent of the urban population, or about 3 million people.

Services received from physicians on hospital staffs were in many cases included within free "hospital care." There were many instances of hospitalization in which the information reported in the interview did not show out-of-pocket expenses for physician services, insurance benefits received, or free physician care. Many of those reporting care in veterans hospitals and military hospitals, for example, did not report free physician services.

Table 1. Number of persons reporting free care in Public Health Service subsample of Bureau of Labor Statistics interview schedules, 1950

| Family out-of-pocket medical care expenditures | Sampling ratio (percent) | Number of persons | Number of persons reporting free care |
|--|--------------------------|-------------------|---------------------------------------|
| Total..... | ----- | 7, 639 | 572 |
| None..... | 50 | 633 | 110 |
| \$1-\$199..... | 10 | 2, 236 | 169 |
| \$200-\$399..... | 20 | 1, 930 | 104 |
| \$400-\$999..... | 50 | 2, 287 | 165 |
| \$1,000 and over..... | 100 | 553 | 24 |

Table 2. Percentage distribution of urban residents reporting free medical care, by type of care, 1950

| Type of free care | Residents reporting free care | |
|--|-------------------------------|----------------|
| | Major type | Multiple types |
| Total..... | 100.0 | ----- |
| Hospital..... | 19.4 | 19.4 |
| Physician..... | 38.9 | 59.2 |
| Nurse..... | 1.4 | 1.4 |
| Dental..... | 6.4 | 9.0 |
| Laboratory tests, immunizations, and X-rays..... | 18.2 | 19.0 |
| Clinic..... | 1.2 | 1.3 |
| Drugs..... | 1.3 | 5.5 |
| Other..... | 2.6 | 2.7 |
| No report..... | 10.6 | 10.6 |

In other instances, the families reported free physician services along with hospital care. The information was tabulated attributing physician services uniformly to those urban residents reporting free hospitalization, if the information did not otherwise indicate the purchase of physician services. If the multiple entries are counted in this way, almost 6 of each 10 persons reporting free services received free physician care, including, in this instance, free care provided by physicians on staffs of hospitals.

Moreover, for those persons reporting multiple types of free services, a single, major type was selected according to the relative importance of the service. Entries reporting free "hospital care," for example, were counted only as a free hospital service even though other types of care were also noted. Similarly, if the respondent reported free physician care outside of a hospital and also free X-ray, drugs, or other services the care was classified as free physician care. The order of the classification of entries corresponds to the arrangement in table 2.

Table 3 shows a distribution of the sources of free care. Each type of source, when multiple aid was reported, and the major source, as listed, are included.

A large proportion of the respondents, some 28 percent of those reporting free care, did not report the source of free care received. Of

about each member of the family. The interviewers were instructed, with regard to these questions, that free medical care "is available in many cities in public and private clinics and health centers. Free chest X-rays are given by the Public Health Service. In addition, many employers have a doctor on their staff who provides medical care to employees at no charge. It may be difficult for a respondent to estimate the value of such service but ask him to give you his best guess, and to describe in detail what he received. Write your description of the services received in a footnote. Do not include medical care received because a family member is covered by a prepayment plan" (4).

Information on types of free care and their sources is taken from the interviewers' notes as recorded on the interviews. The classifications set forth in tables 2 and 3 are means of grouping the entries and are not part of the original questions.

As the instructions to the enumerators suggest, benefits paid by health insurance plans, including insurance financed in whole or in part by employer contributions, are excluded from free care. However, other types of insurance benefits and medical services recorded as free care by the interviewers were included: (a) automobile and other casualty insurance received as a result of an accident, (b) workmen's compensation medical services and inplant medical services, and (c) medical services in union health facilities and in special railroad hospitals. Other types of free care included care provided in public hospitals or financed under public programs such as public assistance programs, care financed by private welfare, health, and religious agencies and hospitals, and care provided without charge by members of a health profession as a matter of professional courtesy or as charity. The entries on free care appear to exclude medical services received at less than full rates, for example, reduced hospital charges.

There seemed to be some instances in which respondents interpreted free care as care paid for by a relative or friend. We excluded these entries from free care and from the tabulations presented here. Because the value of services was only roughly guessed no attempt was made to tabulate responses on that score. However,

the Bureau of Labor Statistics has tabulated these value items as part of the value of free items received for all goods and services. The amount of free medical care, according to an unpublished report of BLS, averaged \$19 for all urban families, including families who reported no free care, and \$123 for the 15.4 per cent of families reporting some free medical care.

Limitations of Data

The Bureau of Labor Statistics study was designed to provide benchmark data on cost of living of urban families. Items of information on the interview that were not related specifically to the consumer price index were not defined as carefully nor edited as thoroughly as other items.

The supplementary nature of the question on free care suggests that interviewers did not seek or obtain detailed and uniform answers. Different respondents may have interpreted the question differently. There are patent differences in the completeness of information obtained by interviewers.

Our findings necessarily reflect the definition of free care used by the Bureau of Labor Statistics, the errors in reporting information, in sampling, and in estimating the aggregates, and the under-reporting of types of free services such as chest X-rays and school health services. In interpreting these findings, furthermore, the small sample size (table 1) must be borne in mind.

Type and Source of Free Care

Urban families reported receipt of a wide range of services free of charge (table 2). These included physician services, hospital care, nursing care, dental services, laboratory tests, immunizations, X-rays, and drugs.

Free hospital services were obtained by 2 in each 10 of those reporting free services, a proportion representing about 1.5 percent of the urban population and almost 12 percent of those reporting hospitalization during the year. This proportion includes persons who reported care without charge (a) in State and local public hospitals and in Federal hospitals, including

with employment. For example, medical care under workmen's compensation, under union and employer plans, and under Government programs (such as the program for merchant seamen and for members of the armed services) is available only to those attached to a work force. Income levels of those receiving such care are related to the earnings in these employments.

The nurse receiving care in the hospital and the relative of a physician or dentist receiving care through his office illustrate another category of care which is not related to low family come.

Medical Expense Differentials

Are free services received primarily by individuals who have no expenses or small out-of-pocket expenses for medical services? Of the urban population as a whole, 17.4 percent reported no out-of-pocket expenses for medical care during 1950, whereas 1.3 percent reported no out-of-pocket spending along with free care. About 48 percent of the urban population reported medical expenditures of \$1 to \$49; 3.6 percent reported medical expenses of \$1 to \$49 with free care (table 6). Or stated somewhat differently, there is a curvilinear relationship

Table 5. Distribution of urban residents and of urban residents reporting free care, by family income after taxes, 1950

| Family income group | Percent of all residents ¹ | Percent of residents reporting free care | Percent in each income group reporting free care |
|------------------------|---------------------------------------|--|--|
| All income groups----- | 100.0 | 100.0 | 7.2 |
| Under \$1,000----- | 3.1 | 5.4 | 12.9 |
| \$1,000-\$1,999----- | 8.6 | 12.5 | 11.3 |
| \$2,000-\$2,999----- | 16.8 | 16.2 | 7.9 |
| \$3,000-\$3,999----- | 25.5 | 23.2 | 6.5 |
| \$4,000-\$4,999----- | 19.1 | 15.8 | 5.6 |
| \$5,000-\$5,999----- | 11.4 | 12.4 | 7.7 |
| \$6,000-\$7,499----- | 7.9 | 9.6 | 6.9 |
| \$7,500 and over----- | 7.6 | 4.9 | 4.4 |

¹ Derived from Study of Consumer Expenditures, Income and Savings; Vol. 18, Summary of Family Incomes, Expenditures, and Savings, All Urban Areas Combined. Philadelphia, Wharton School of Finance and Commerce, University of Pennsylvania, 1957, p. 2.

Table 6. Out-of-pocket medical spending by urban residents and by urban residents reporting free medical care, 1950

| Out-of-pocket medical care expenditures | Percent of all residents | Percent of all residents reporting free care | Percent in each expense group reporting free care |
|---|--------------------------|--|---|
| Total----- | 100.0 | 7.2 | 7.2 |
| None----- | 17.4 | 1.3 | 7.6 |
| \$1-\$49----- | 47.9 | 3.6 | 7.4 |
| \$50-\$99----- | 17.5 | 1.2 | 6.9 |
| \$100-\$199----- | 10.2 | .7 | 6.5 |
| \$200-\$299----- | 3.7 | .2 | 4.8 |
| \$300-\$499----- | 2.1 | .1 | 5.6 |
| \$500 and over----- | 1.2 | .1 | 9.0 |

between receipt of free medical care and size of out-of-pocket medical expenses.

Of urban residents reporting no out-of-pocket expenses, 7.6 percent indicated they received free care; 7.4 percent of those reporting expenses from \$1 to \$49 reported free care. The percentage of persons reporting free care is lower than average for each of the medical expense classes from \$50 to \$500 of out-of-pocket expenses. Of those spending \$500 and over for medical care, however, 9 percent reported some free care. This finding suggests the need to explore such questions as how private spending for medical care is supplemented by free services, through what agencies and arrangements individuals with expensive illnesses gain access to free services, and whether there are barriers to such access which necessitate large out-of-pocket family spending before free care can be received.

In general, our purpose here has been to stimulate interest in the distribution of free medical care among groups differing in age, income, and medical expense, and to encourage further study.

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those reporting free care, approximately 13 percent received services as professional courtesy or as charity; another 13 percent received care through public assistance agencies; and for 14 percent services were paid for by employers. Included in the last are implant medical services, services in connection with workmen's compensation cases, and employer arrangements other than health insurance. As indicated earlier, reporting instructions explicitly excluded services received under health insurance plans toward which the employer contributed all or part of the premium.

Free hospital care was financed by public assistance or by Federal agencies for more than half of those reporting free hospitalization.

Age and Income Differentials

The proportion of persons reporting free care varied by age group (table 4). Free care was reported for only 4 percent of the children under 6 years living in urban households. In contrast, 8.8 percent of those 19-44 years of age reported receiving free care. The percentage of persons 65 to 74 years of age reporting free care was less than the average for all age groups; however, the proportion of those 75 years of age and over was about the same as the average for all age groups.

In view of the volume of care provided for children through schools, clinics, and public

Table 3. Percentage distribution of urban residents reporting free medical care and free hospital care, by source of care, 1950

| Source of free care | Residents reporting free care | | Residents reporting free hospital care |
|--|-------------------------------|------------------|--|
| | Major source | Multiple sources | |
| Total | 100.0 | | 100.0 |
| Public (State and local) and nonprofit hospitals | 6.6 | 6.6 | 19.4 |
| Federal agencies | 13.6 | 13.6 | 26.0 |
| Public assistance | 12.6 | 12.6 | 30.6 |
| Other organizations | 11.1 | 11.6 | 1.5 |
| Employers | 13.7 | 13.9 | 7.7 |
| Health professions | 12.6 | 12.9 | 5.7 |
| Casualty insurance | 1.3 | 1.3 | 0 |
| No report | 28.5 | 28.5 | 9.1 |

Table 4. Percentage of urban residents in each age group reporting free medical care, 1950

| Age group (years) | Percent |
|-------------------|---------|
| All age groups | 7.2 |
| Under 6 | 4.0 |
| 6-18 | 7.4 |
| 19-44 | 8.8 |
| 45-64 | 6.4 |
| 65-74 | 6.1 |
| 75 and over | 7.5 |

health departments, it would appear that free care for children, especially those under 6 years of age, is under-reported.

Tests of income and means applied in the administration of many public programs as well as programs of voluntary welfare and health agencies suggest that persons receiving services provided without charge are primarily in low-income families. Our findings indicate no great concentration of free services in low-income families. Those with relatively high family incomes also received free medical care. Approximately 18 percent of the persons reporting free care were in families with incomes of less than \$2,000 per year; about 12 percent of all urban residents in 1950 were in families with incomes below \$2,000. At the other end of the income scale, about 5 percent of those receiving free care were in families with incomes of \$7,500 or more, whereas 7.6 percent of all urban residents in 1950 were in families with that income (table 5).

A larger percentage of urban residents in families with incomes under \$2,000 reported free medical care than those with higher incomes. The percentage of persons reporting free medical care decreases until the income level reaches \$4,000 to \$4,999 and then tends to increase except for the highest income level. This pattern of receipt of free medical services by income classes may reflect differences in types of free medical services available in the community. While free care contingent on need is available through public programs such as public assistance programs and State and local public hospitals and through veterans' benefits for non-service-connected disabilities, there are other types of medical care programs under which eligibility is connected

Gerontology

DISCUSSION GROUP

The following are authors' abstracts of presentations to the gerontology discussion group at the National Institutes of Health, Public Health Service, during the first 6 months of 1958.

The planning of this series originated in the gerontology discussion group at the National Institutes of Health. In 1954 a group of about 20 staff members from various fields at the Institutes decided to meet once a month for informal discussion of some selected aspect of gerontology. The meetings have continued to this date with a de-emphasis on formality. The first chairman was Dr. Paul Stevenson of the National Institute of Mental Health, who served, until his retirement at the beginning of 1955, in arranging for speakers in response to suggestions of the group and of scheduling the meetings at appropriate times. In 1957, the discussion group was sponsored by the newly formed Center for Aging Research, under the direction of Dr. G. Halsey Hunt, to encourage the free exchange of information on aging.

Apart from the specific content of the presentations, other facts have emerged about gerontology in this 4-year period. Interests are clustered about certain foci: the molecular level; the general biology of the whole organism; the disease processes; the psychological aspects of aging; and the sociological or societal aspects. These seemed to be the respective interests of the gerontologists themselves at the lectures. It also became apparent in the discussions that it is impossible to compress gerontology into the confines of a single discipline, profession, or dogma.

—JAMES E. BIRREN, PH.D., CHAIRMAN, *chief of Section on Aging, National Institute of Mental Health, Public Health Service.*

Age Changes in Cells

When an animal grows old, cells in various parts of the body deteriorate so that they are no longer able to fulfill their various functions as efficiently as they did when the animal was younger. Why is this true? We should like very much to find out, for if we knew perhaps we could find some way of delaying the aging process.

For many years, cytologists have tried to discover in what ways an aging cell differs from a young cell. The results of their painstaking studies have not been impressive, and even though an occasional morphological change has been described, we know nothing about the why and wherefore of such change. Perhaps the main reason is that cytologists, both those using ordinary light microscopes and those using electron microscopes, have compared the appear-

- (2) Mushkin, S.: Age differential in medical spending. Pub. Health Rep. 72: 115-120, February 1957.
- (3) Mushkin, S.: Characteristics of large medical expenses. Pub. Health Rep. 72: 697-702, August 1957.
- (4) U. S. Bureau of Labor Statistics: Survey of con-

- sumer expenditures in 1950; collection manual. Washington, D. C., January 1951, p. 114.
- (5) Anderson, O. W., and Feldman, J. J.: Family medical costs and voluntary health insurance; a nationwide survey. New York, McGraw-Hill, 1956, p. 139.

Specialized Training Courses in Environmental Health

The following courses are scheduled for January and February 1959 by the Robert A. Taft Sanitary Engineering Center in Cincinnati, Ohio:

January 12-23. Basic Radiological Health. Fundamental technical knowledge needed for radiological health work, with stress on basic nuclear physics and chemistry. Prerequisite for several other courses.

January 12-16. Chemical Microscopy for Analysis of Air Pollutants. Emphasizes the applicability of techniques of chemical microscopy, conventional and polarized, to qualitative and quantitative identification of atmospheric particulates.

January 26-30. Radioactive Pollutants in Air. Intensive training for professional persons concerned with radioactive contamination of the air. Laboratory practice, using commercially available sampling and monitoring instruments, comprises about half of the course.

January 26-30. Sanitary Bacteriology of Water. Extensive coverage of bacteriological examination of water, including the most probable numbers methods and the membrane filter method.

February 2-6. Microbiological and Chemical Examination of Milk and Dairy Products.

Theory, laboratory techniques, and interpretation of tests used in evaluating the sanitary quality of milk and dairy products.

February 9-13. Laboratory Methods for Prevention and Control of Foodborne Disease. Methods, standards, and operating procedures for a food sanitation program. Demonstrations and laboratory exercises include microbiological and chemical methods for food quality control, and procedures for enumeration, isolation, and identification of food poisoning bacteria.

February 9-20. Community Air Pollution. Broad, technical coverage of air pollution including the roles of the community, State, Federal Government, and industry, and ordinances and legislation.

February 16-20. Radioactive Pollutants in Water. Intensive training for water supply and pollution control officials concerned with the radioactive contamination of water. Prior completion of the basic radiological health course is desirable.

Address applications to the Chief, Training Program, Robert A. Taft Sanitary Engineering Center, Public Health Service, 4676 Columbia Parkway, Cincinnati 26, Ohio, or the medical director in a regional office.

through old age. In an early study on the adult worker honey bee, the brain (like that of mammals, including humans) showed a slow but steady fall in number of the original cells from the first day of adult life to a total loss of 35 percent of that number by extreme old age. In the honey bee, enzyme studies of the brain (cholinesterase) and of muscle (phosphatases) related to energy buildup and release failed to show any corresponding changes with age. However, the quantitative relationships among these enzyme systems appear to be concerned with development and maintenance of flight ability, which is well developed in advanced old age. In the male housefly, on the other hand, which loses its ability to fly by the 10th day of adulthood, the wings are frayed, and both the acid phosphatase and the magnesium-activated adenosinetriphosphatase show pronounced drops in activity to a minimum by the 10th day.

During the course of this biochemical study, moreover, it became apparent that male houseflies had a considerably shorter average as well as shorter maximum longevity. By a series of studies involving constant humidity, temperature, and conditions of maintenance and rearing, longevities of male and female flies were compared in offspring from hundreds of generations of breeding of a standard laboratory strain of houseflies. Data accumulated for more than 4,000 pairs of flies of both sexes confirm the presence of an aging factor in the male which results in a longevity that is almost 70 percent higher for the female than the male. Experiments with reduced and enriched diet for the aging adult show that the average longevity of the male is not altered by such dietary variations; the female longevity, on the other hand, can be increased by inclusion of powdered whole milk in a sugar and water diet fed to the aging adult.

In a current study, the possible presence of a "Lansing" factor in the aging of houseflies is being investigated. Eggs, usually collected at a very young parental age, were collected at later and later parental ages; offspring from these collections were isolated and allowed to age under controlled conditions of temperature, humidity, and complete diet. First results

clearly indicate that longevity of the male offspring is the same, regardless of the parental age at which the egg has been laid. In the case of the female offspring, after the sixth day of adult life, the older the parents at oviposition, the shorter the average longevity of the offspring. The 30-day mortality of female offspring hatched from eggs collected from parents 27 days old, for example, was 90 percent, exactly equal to that of males from eggs laid at all ages. A mortality of 50 percent was found for female offspring of young parents, on the other hand.

Thus, for the housefly, it appears that there is a relatively immutable aging factor in the male as opposed to an aging or longevity factor in the female which is labile to the extent that a limited diet as well as advanced parental age at the time of oviposition markedly reduces the average and maximum longevities of such females.

Studies are being continued on the relative roles of the male and female parents in the curtailment of the longevity of female offspring hatched from eggs collected at an advanced parental age.

—MORRIS ROCKSTEIN, PH.D., *associate professor of physiology, New York University College of Medicine, New York City.*

Aging and Longevity in Rats Under Favorable Conditions

In 1945, a special rat colony for research on aging and longevity was set up in an old building at the Columbia-Presbyterian Medical Center. We attempted to produce conditions as ideal as possible in the belief that, for satisfactory results, the colony had to be maintained under uniform conditions for a long period, with freedom from noise and other disturbances and with the elimination of infectious diseases.

To this end, we installed an air conditioning system with temperature and humidity control. We adopted a uniform diet, which has been used for the last 13 years. All outside light was closed off. Indirect fluorescent lights were installed on a time switch to give 12 hours of light

ance of dead old cells with the appearance of dead young cells. And the methods used in killing cells so that they may be sectioned and stained could easily destroy any evidence of age changes in the protoplasm.

Physically, the cell is a colloidal engine, and it is proper to look for changes in the colloids of which this engine is composed. In order to appreciate the types of changes that may occur, we need to know the nature of the protoplasmic colloid. The work of many years has shown that the interior protoplasm in the cell is fluid surrounded by a stiff cortex.

This protoplasmic fluid does not behave like an ordinary protein or an admixture of such protein and lipid; it is strangely sensitive and can suddenly change from a fluid (sol) state to a more or less stiff gel. This reaction is similar to that occurring when the blood of vertebrates clots. The reaction is dependent on the presence of calcium and also on the activation of a clotting, proteolytic enzyme. Work on the nature and reactions of the protoplasmic colloid has been summarized in two books by the author, the *Dynamics of Living Protoplasm*, published in 1956, and the *Viscosity of Protoplasm*, which appeared in 1958.

According to E. Gunther's article in *Protoplasma* in 1957, when plant cells age the outer cortical layer becomes less rigid and the interior protoplasm becomes decidedly more viscous. This is exactly what I found in 1956 for aging egg cells of the marine worm *Chaetopterus*, as reported in *Protoplasma*. The loss of rigidity in the cortex of a cell is generally due to a loss of calcium from this region. The cortex normally behaves as a semipermeable membrane and offers resistance to the passage of ions into a cell. As is well known, the permeability of a cell membrane increases as the presence of calcium in it declines; as the cortex loses calcium, the cell becomes more permeable to calcium ions. The result is that calcium enters aging cells more readily than it does young cells. This is presumably why so many aged cells and tissues have been found to have a higher calcium content than young ones.

Because the protoplasm in the cell interior is so sensitive to calcium, entrance of calcium in increased amounts can cause a clotting re-

action, as already noted. For this reason old cells may show increased viscosity of their interior protoplasm or may even become vacuolated, for pronounced clotting often causes vacuolization. Moreover, aging cells tend to suck more and more calcium out of the blood; this tends to lower the calcium content of the blood. Such a lowering of calcium concentration in the blood is known to result in a loss of calcium from the bones, hence the diseases of osteoporosis and osteomalacia, so common in old people.

Naturally, we are far more interested in the age changes that occur in higher animals than in those in plants or in the egg cells of invertebrates. Recently an attempt has been made to study the colloidal changes that occur in the course of the aging process in the cells of cats. Such studies are far more difficult to make and various technical difficulties have to be overcome. However, it is possible to study living muscle fibers of kittens and mature cats, and such studies have commenced. Also attempts are being made to study the colloidal properties of liver cells from cats of various ages.

—L. V. HEILBRUNN, PH.D., *professor of general physiology, University of Pennsylvania, Philadelphia, Pa.*

Aging in Insects

Although not a guarantee of expected results, the wise choice of a suitable animal for laboratory research may often prove to be the basis for the slim margin of difference between success and failure of an experiment.

For studies in aging, members of the largest of all animal phyla, the Arthropoda, appear to be ideal because of their small size, low cost of maintenance, relatively small space requirements for large numbers of animals, and high reproductive potential. Most of all this high reproductive potential is linked to a relatively short life history, as few as 29 days on the average for female houseflies (17.4 for males) and 33 days for adult worker honey bees.

These two species of insects have been the subjects of structural, biochemical, and biological studies from the moment of emergence

who do, not all are equally afflicted; many who receive good care may require it less than some who receive little or none.

Where psychotherapy is regarded as a luxury, psychiatric disorders will not be identified; where the needs for physical care remain unrecognized because of socioeconomic circumstances, frank illness and associated emotional disturbance may pass for physiological decline. If we are to provide services for aged persons to match their real needs for medical care by present-day standards, the way inequalities in the distribution or receipt of care come about must be studied, especially where governmental or charitable agencies are instrumental in providing these benefits. A knowledge of the characteristics of persons now receiving different types or gradations of socio-medical treatment may permit inference or clarification of how they were selected for care or suggest preventive measures.

As part of a preliminary survey for the New York State Department of Mental Hygiene, more than 600 persons 65 years of age or over selected at random from nursing homes, old-age homes, and State hospitals were examined for comparison of their physical and mental functioning. The nursing home population was in the poorest condition from the point of view of physical function, while persons in the homes for the aged functioned best. Those in State hospitals were intermediate. About 40 percent of the aged first admissions to a hospital who survived the first 3 months required active medical care. New admissions to the State hospitals were in the poorest physical condition of all. Aged persons readmitted to the State hospitals for disorders developed in early years were generally in good physical condition.

Advanced age and physical disability tended to go hand in hand in State hospitals and in homes for the aged; nursing home residents showed the same degree of disability at all ages. Persons beyond the age of 75 appeared to have physical disability with equal frequency in all institutions. Patients in the best physical condition did best on tests of mental status as indicated by comparison of the institutional population.

Two hundred and ninety-three subjects 65

years and older selected on a random basis from the variety of nursing and old-age homes were tested by M. Pollack and R. Kahn for the capacity to perceive properly simultaneous tactile stimuli to the face and hand. About half of the subjects made persistent errors. The results exactly paralleled those of questionnaire examinations for mental status. The defects in perception were found in increasing numbers with advancing age and decreasing function but preponderantly in persons where early formal education was absent or scant.

The institutions studied were relatively homogeneous both as to the background of their residents and to the general level of alertness of the residents. There are apparently interpenetrating factors of selection which create an institutional milieu. Furthermore, these factors have a continued influence in maintaining the cultural milieu. The residents contribute to a culture which in turn acts upon them for better or worse. In this way, up to a point, the good institutions probably grow better and the poor grow worse.

The findings imply that disorders of perception related to disorientation and mental disorder in the aged are strongly influenced by cultural background and also are related to physical functional capacity. In our society good early education may act as a protection against decline of mental and physical functioning in the later years; it may help to provide special protective devices for oneself; or it may be an index for correlated protective factors. In all likelihood all these possibilities are true. The sequence may be: poor education contributes to socioeconomic deprivation, socioeconomic deprivation contributes to illness, illness to invalidism or impairment of function, impairment of function to mental disturbance, mental disturbance to disability or invalidism, and invalidism to socioeconomic deprivation.

Studies of this nature appear doomed to uncover the banal, but the manner in which the obvious is uncovered may suggest practical measures for prophylaxis and treatment. By inference, a large number of the mental disorders of the aged can be traced to economic and health problems of their preceding years. Good socioeconomic circumstances, good education

and 12 hours of darkness each 24 hours, and special cages and shelves were designed for our purposes. In addition, we have endeavored to avoid unnecessary noises and rough handling.

Our stock of animals came originally from the Sprague-Dawley Laboratories. From these original animals we have bred our own with 2 closed lines of random-bred animals and 2 lines of brother-sister meetings.

In the beginning, as in other rat colonies, there was a high incidence of respiratory disease, which now has practically been eliminated. This was done by Dr. Benjamin N. Berg, who destroyed all obviously infected animals and all suspected of having respiratory infection, as well as those which failed to gain weight in a normal manner. Thereafter, with a colony nearly free from respiratory disease, we have been able to study the onset of lesions of other diseases without the complication of pulmonary infection.

As our animals become older and reach a moribund state, they are killed and given complete autopsies. The data obtained are carefully tabulated so that we have been able to determine the relationship between age and the onset of lesions of various types and to study the development of these lesions from early to severe stages.

We have recently published a study of the data on five major diseases in male rats (Simms and Berg, in the *Journal of Gerontology* 12: 244-252, 1957). Findings show that for each of these diseases the onset of the early lesion gives a sigmoid curve when plotted against age, but the shape of the sigmoid curve depends upon the type of lesion. For example, myocardial degeneration has a relatively flat curve. This disease is first seen in some of the animals as early as 200 days of age, but a period of 900 more days elapses before the curve levels off with no further incidence. On the other hand, degeneration of voluntary muscle is not seen until 550 days of age, but the curve rises so sharply that there is a 100 percent incidence after only 550 more days.

With some diseases, such as periarteritis, only a portion of the animals are susceptible. The remainder are apparently immune to this disease, with the result that the sigmoid curve levels off at 60 percent incidence. Similarly,

adenoma of the pituitary is found in less than 25 percent of the older animals, but all those susceptible acquire this tumor before 900 days.

The logarithmic increase in the human death rate with advancing age, first reported by Gompertz in 1825, has been a matter of concern for many years. The reason for the logarithmic increase has not previously been explained. Our data on rats show that their mortality follows a similar but very much steeper logarithmic curve. We have been able to show that this is not due to a change with age in the duration of the diseases from early to late stages but rather because the mortality parallels the onset of the major diseases that contribute to the death of these animals. As was stated above, the onset of these major diseases has a typical sigmoid curve. We have found, furthermore, that the probability of onset of new lesions of each disease when plotted against age gives a curve with a definite peak suggestive of a normal distribution curve. In other words, for each disease there is an age of maximum probability of acquiring a new lesion of this disease, and the resulting mortality follows a logarithmic curve, like the human mortality curves with which we are familiar.

—HENRY S. SIMMS, PH.D., *Columbia University College of Physicians and Surgeons, New York City.* (This study was carried out on grants from the Josiah Macy, Jr. Foundation and the Albert and Mary Lasker Foundation, and grant H-945 from the Public Health Service.)

Evaluation and Treatment of Older Persons in Need of Psychiatric Care in a Metropolitan Area

By current standards, mental disorder is common, and emotional ills, by some definition, affect everyone. However, circumstances often dictate that treatment be reserved for disturbed and disturbing persons who need specialized care for their welfare or that of society. Even for them there may be limited resources. Obviously, not all psychiatrically ill older persons reach points of medical care. Of those

jects to acquire the conditioned eyeblink response. Of the 13 subjects in this group, 4 subjects gave no conditioned responses during the 80 conditioning trials, 7 gave from 1 to 8, while 37 and 75 were given by the other 2 subjects. There were no instances of failure to condition in the two younger groups. This result confirms the report of Gakkel and Zinina although their study does not include data on the conditioning performance of younger subjects. To account for the failure of older subjects to condition, Gakkel and Zinina quote Pavlov as concluding that "liveliness of the nerve processes suffer(s) from the development of senile changes." They also invoke the construct of inertia of the stimulating process at senile age.

These results suggest the consideration of an adaptation hypothesis to account for the relative unconditionability of elder subjects. It is known that subjects who were adapted to the UCS (air puff) showed a significantly lower level of conditioned eyelid responses than subjects who were not given pre-adaptation trials. It is proposed that in the course of many years of living the eyelid response and probably other responses have been "adapted out" and thus are less susceptible to subsequent conditioning. Research is underway to study several consequences of this hypothesis: that both frequency and amplitude of blink are reduced as a function of age. The procedures employed in the present study did not provide data on these variables.

—HARRY W. BRAUN, PH.D., *professor of psychology, University of Pittsburgh. (This investigation was supported in part by research grant M-1365 from the National Institute of Mental Health, Public Health Service. Richard Geiselsart assisted in the study.)*

Cornell Longitudinal Study on Occupational Retirement

The Cornell study of occupational retirement is a longitudinal study of a panel of subjects, most of whom were born in 1887, 1888, or 1889. Currently, there are approximately 2,400 participants in this study; they do not constitute a

representative sample in a statistical sense, but represent widely divergent backgrounds and all the geographic regions of the country, although the major concentration is from the more heavily industrialized sections. With the exception of a disproportionate number of professionals, the participants approximate the total male employed population from age 60 to 64. The investigators consider the population to represent the "normal aged."

In this preliminary analysis of findings from the study, the major independent variable is occupational status or the change in that status from worker to retiree. The dependent variables, adjustment, subjective health, and economic deprivation, approximate the Guttman scalar pattern. Emphasis is upon the incidence of changes among the persons who retire and those who continue in gainful employment.

Our data have not supported the hypothesis that, in general, retirement leads to a decline in adjustment. We have found that continued employment for some older persons may result in a decline in certain measures of adjustment equal to or greater than changes experienced by persons who retire. This general finding was confirmed by data from the two periods under analysis: 1952-54 and 1954-56.

Age identification as a measure of adjustment was also examined; the data suggest clearly that retirement does not result in a deterioration in age identification. The retired are no more likely to experience a decline in age identification than the gainfully employed.

We also examined the data on the relationship between the forms of retirement and adjustment and we noted that a person's attitude before retirement is a more influential factor affecting a person's adjustment than the circumstances surrounding retirement, that is, whether the decision was made by the person himself or his employer. Persons who have negative attitudes toward retirement are more likely to evidence inadequate adjustment in retirement than are those with positive attitudes before retirement.

By means of the longitudinal analysis, it was shown that the association between retirement and health is largely explained by the fact that people in poor health tend to retire and not that retirement affects health negatively. This

early in life, and the protection of physical health through the provision of social, public health, and general medical services promise to decrease the number of disoriented aged persons and the intensity of their disorders in the future. For those now ill, social rehabilitation techniques and good general medical treatment may mean the reclamation of a number of disoriented and maladjusted aged persons. Mutually damaging reciprocating relationships of person and institution should be interrupted; at times this requires no more than provision of the very important service for the protection of mental health: good medical care.

—ALVIN I. GOLDFARB, M.D., *office of the consultant on services for the aged, New York State Department of Mental Hygiene, Queens Village, N. Y.*

Age Differences in the Acquisition and Extinction of Conditioned Eyelid Responses

The eyeblink is difficult to condition in persons over 65 years of age, but when conditioned, is more resistant to extinction, according to a report by L. B. Gakkel and N. V. Zinina in the *Fiziologicheskii Zhurnal* (Moscow) in 1953. This report stimulated a study to provide systematic information on eyeblink conditioning and extinction among children and young and old adults under the same controlled conditions.

The subjects were 15 boys in the age range 8–10 years, with a mean age of 9.36 years; 15 young men aged 18–25 years (mean age 20.63 years); and 13 men aged 62–84 years (mean age 70.5 years). The old adults were noninstitutionalized and were either employed full time or part time or were retired.

The conditioned stimulus (CS) was an increase in the brightness of a 6-cm. circular milk glass disk from 1 to 1.5 apparent foot-candles. The duration of the CS on each trial was 1 second. The unconditioned stimulus (UCS) was a puff of air with an intensity of 2 pounds per square inch delivered to the right eye, with a duration of 500 milliseconds. All subjects were given 80 conditioning trials. Intertrial intervals were spaced at 10, 15, and 20 seconds ac-

cording to a prearranged schedule. Following the 80th conditioning trial, 20 extinction trials were given in which the CS–UCS interval was lengthened to 1,500 milliseconds. Subjects were tested in a dark and relatively quiet room. The equipment for recording eyeblinks and presenting the CS and UCS was similar to that of K. W. Spence described in the *Journal of Experimental Psychology* in 1953.

Through the 60th conditioning trial, the conditioning curve for the children was consistently above that of the young adults, and it was above that of the elderly group throughout the entire 80 trials. The conditioning performance of the young and old adults was similar through the first 20 trials after which the young group improved markedly and the elderly group only slightly. The conditioning curve of the children was negatively accelerated, that of the young adult group was positively accelerated, while the curve of the old adults was flat. At the start of conditioning, either the performance level of the children or the rate of conditioning was relatively high or both were high. On the other hand, the performance level of the other two age groups at the beginning of conditioning was relatively low or the rate of conditioning was slow or both conditions prevailed.

Statistical evaluation of these results was made by the Mann-Whitney test. The difference between the number of conditioned responses made by the children and the old adults was significant beyond the .002 level of confidence for a two-tailed test ($U=23$). The difference between the number of conditioned responses made by the young adults and the old adults was also significant beyond the same level of confidence ($U=25$). The children and young adults did not differ significantly in the number of conditioned responses ($U=89$).

Resistance to extinction was also inversely related to age. The use of the Mann-Whitney test showed that the children made significantly more conditioned responses during extinction than the elderly adults ($U=27$; $P<.002$) as did the young adults ($U=49$, $P<.05$). The two younger groups did not differ significantly in this respect.

The main and striking finding of this study was the relative inability of the elderly sub-

Public Health and Medicine

exhibit

Brussels World Fair

J STEWART HUNTER

AN EXHIBIT on public health and medicine in the United States was on display at the Brussels World Fair between August 18 and October 19, 1958. Housed in three buildings adjacent to the main American Pavilion, the exhibit was designed and built by the Public Health Service.

Mr. Hunter is Assistant to the Surgeon General for Information, Public Health Service. Mr. Hunter, William Thompson, assistant chief, Visual Aids Branch, Department of Health, Education, and Welfare, and Harry Wiener, visual information officer, Bureau of State Services, Public Health Service, formed the three-man team who conceived and built the exhibit in Brussels after some preliminary planning in the United States.

Its purpose was to tell the story of progress in American health during the past several decades with some emphasis, as well, on the unfinished tasks that lie ahead.

A display on American health was considered important for several reasons:

First, how a nation provides for the health of its people is a significant gauge of how that nation lives. In Dr. Howard Rusk's phrase, "The emphasis we place on dignity and service for our sick and handicapped is [also] a hallmark of life in America."

Second, the story of American accomplishments in health is exportable. Health techniques, methods, knowledge, and facilities developed in the United States are now being used in many parts of the world. We are al-

part of the analysis is based primarily upon self-appraisals of health; but the findings are substantiated by the analysis of objective changes in health, that is, ratings by examining physicians. As in other studies, we do find a higher incidence of relatively poor health among persons who have retired, but it would seem that this correlation can be understood in terms of poor health leading to retirement and not the reverse.

One of the most obvious and objective effects of retirement is economic, for it is the rare retiree who is able to maintain his preretirement income. However, it seems agreed by a number of students of retirement that objective income must be interpreted in terms of the needs and wants of the persons. The researcher studying retirement must be aware of the subjective aspects of income. In the Cornell study we developed a measure of what we call economic deprivation in order to determine changes in attitude regarding objective changes in economic status. The panel analysis shows clearly

that retirement contributes to the development of economic deprivation. However, the data also indicate a perhaps more striking finding: a high proportion of retirees possess a sufficient "role flexibility" that enables them to adapt to a greatly reduced income.

One general conclusion from this study, of which a fuller report appears in a forthcoming issue of the *Journal of Social Issues*, is that longitudinal surveys of retirement can point to the need for reexamining some stereotyped ideas about the effects of retirement. There appears to be a wider range of adaptability and adjustment than is commonly thought.

—GORDON F. STREIB, PH.D., *professor of sociology, Cornell University. (Initially supported by funds from the Lilly Endowment, Inc., the study now continues through grants from the National Institute of Mental Health, Public Health Service. Contributions to the analysis were made by Dr. Wayne E. Thompson, assistant professor in Cornell's sociology and anthropology department.)*

New Sections of *Excerpta Medica*

Two new sections of *Excerpta Medica*, Rehabilitation (Section 19) and Gerontology and Geriatrics (Section 20) were begun in July 1958. Each is published monthly by the *Excerpta Medica* Foundation.

With the objective of "opening another avenue to aid the medical professions in this 20th century challenge, the conquest of disability," the Rehabilitation Section is devoted to experimental, clinical, and program aspects. The first issue contains 314 abstracts, arranged according to a preestablished classification system to facilitate reference. Publication of this section is aided by a grant from the Office of Vocational Rehabilitation, Department of Health, Education, and Welfare.

The new Gerontology and Geriatrics Section, aided by a grant from the Public Health Service, covers the whole field of aging and the aging process. Recognizing that the subject is of social as well as medical concern, it includes such topics as social behavior, social welfare, economics, and politics in addition to purely medical problems.



Photographs (left) illustrate hospital and medical care in the United States. Exhibit (right) traces the development of antibiotics from bread mold to the final product in the symbolic petri dish. Tree bears a quotation from Psalm 67, "The earth has yielded its increase . . ."

for each nation remains among mankind's great unfinished tasks.

This is a story of how the battle for better health is being carried on in America and something of the great challenges that lie ahead . . ."

The interior of the first building used the concept of a crumpled newspaper with headlines indicating some of our national problems in health and medicine. The nature of these problems was merely suggested by four photographs illustrating the broad fronts in the fight against illness: prevention, treatment, medical care, and control of the environment.

The second building was devoted to visual treatment of these four broad themes by specific examples which showed, not literally but impressionistically, America's accomplishments and future tasks. Throughout the accompanying text the linkage of medical science in the United States to the scientific accomplishments of other nations was indicated.

A summary of the present health status in the United States introduced the visitor to the second building. A light box containing a color photograph depicted in a series of 15-second flashing light sequences the average size of the various groups in the American family from

1900 to the present. The text pointed out that in 1900 a child at birth could expect to live 46 years; but in 1958, a child at birth can expect to live 67 years, or well into the 21st century.

Opposite the light box was a model of a beating heart, used as a symbol of health. The accompanying text pointed out that in the United States certain of mankind's ancient enemies have been conquered: malaria, typhoid fever, smallpox, diphtheria, pellagra. Others, however, remain: cancer, heart disease, arthritis, mental illness, dental diseases, and the problems of the modern environment.

The section on prevention highlighted the development of the poliomyelitis vaccine, one American story which is well known throughout much of the world. Photographs traced the story from its beginning through research, trial, application, and results. A chart showed the Nation's progress against this disease during the past 4 years. The guides were asked to point out that within weeks after the vaccine proved successful, the United States made its formula known to all the nations of the world.

The Salk vaccine story also illustrated the promise of medical research. "Medical research," an accompanying legend read, "on which the U. S. currently spends over \$400 million annually is a first line of defense. Through the work of scientists the world over, the dark mystery of cancer, the cause of heart disease, and other illnesses will one day be uncovered."

The guides pointed out that Congress, over the past 10 years, has voted increasing amounts for medical research, principally for grants to universities, medical schools, hospitals, and other research laboratories. Industry, universities, and private foundations were credited with their part in this national endeavor.

The guides were coached to emphasize the international character of research, citing the long and illustrious list of scientists from dozens of nations who have contributed to American and world progress in health. This information permitted visitors to identify themselves and their countries with the march of health.

A series of photographs under the general heading of prevention demonstrated another phase of research and its application, the use

ready contributing substantially to health throughout the world, and President Eisenhower has suggested that we seek ways to increase that contribution.

The Brussels fair presented an opportunity to tell that story. The objective, therefore, was not only to show what we do in health and how we do it, but to illustrate the enormous potential which the export of American ideas and techniques in health holds for people in other nations.

Two further points about this exhibit should be mentioned. First, exhibits are not the only nor necessarily the best method of presenting American accomplishments in health to the world. All the techniques of public education and health information could—and should—be employed if we are to do a really significant job on the world scene.

Second, the Brussels exhibit cannot be considered a prototype of exhibits abroad. For example, it was necessary to fit the story into a physical structure designed for another purpose. From mid-April until mid-July the three buildings, used ultimately for the health display, had housed an exhibit on unfinished

tasks in the United States, specifically on man in relationship to man, on man in relationship to nature, and on man in relationship to his environment. Moreover, events obliged us to design and develop most of the health exhibit on the spot within 3½ weeks.

The major problem in planning the exhibit was to encompass the tremendously varied and complex story of American health within manageable visual form. We started with several basic assumptions: (a) the story was not to be told chauvinistically but in a spirit of sensible candor which presented what has been done and what remains to be done in the United States; (b) the exhibit was to include as many elements of public health and medicine in this country as possible, rather than cover the work of a single profession, group, or institution, within or outside government; (c) because of its wide scope, the story had to be presented impressionistically rather than literally.

The decision was made, therefore, to classify health work in the United States under four broad areas of activity: prevention, treatment of the sick and disabled, medical and hospital care, and control of the environment.

To round out the story of American health which the exhibit simply outlined, we relied on a group of young American college students employed in the United States Pavilion to serve as guides, to answer questions, and to describe aspects of American life not fully pictured. These guides were thoroughly briefed and were given fact sheets which contained more detailed information than the displays included.

The theme of the entire exhibit was summed up in the opening panel of the first building:

"Better health is one of man's brightest dreams.

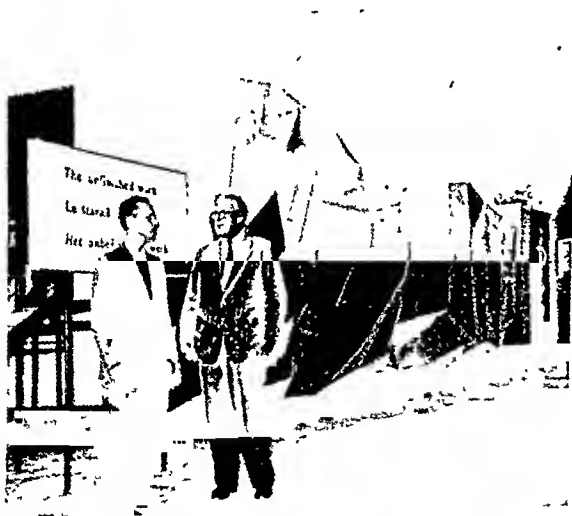
From the beginning, man has fought pestilence, disease, suffering, and premature death.

The face of the enemy is changing . . . from death-dealing scourges to diseases that maim and disable.

The weapons have changed . . . from nostrums to miraculous drugs and the skills of modern medicine.

The scene is changing . . . from the pace of rural life to the tempo of great cities.

But the struggle endures and better health



Outside the public health and medicine exhibit at the Brussels World Fair are Dr. Leroy E. Burney, Surgeon General of the Public Health Service, and (right) Dr. Thurston J. Davies, executive director of the American Pavilion. The panel inscription, like all signs and captions in the pavilion, is in English, French, and Flemish.

promise for mankind. They were asked, for example, to tell visitors of the successful use of antibiotics against yaws in Haiti. Similarly, it was suggested that they mention the conquest of malaria in the United States, and the worldwide malaria eradication campaign now being undertaken through the World Health Organization.

The section on care covered rehabilitation of the ill or handicapped and American progress in developing hospital and medical facilities. "Hospitals are needed for a growing population," the accompanying text read, "and for the care of the elderly whose numbers, in America as in other lands, are steadily increasing. Funds voted by the Congress of the United States or contributed by individual Americans have built thousands of hospitals in recent years. More are being built; more are needed."

In this field, the guides were briefed on the steadily rising level of medical care in America brought about by research, new drugs, new methods of surgery, improved medical and public health practice, and perhaps most important and basic to this rise, the sustained public interest in the improvement of health. They were also given information on the accomplishments of the joint Federal-State-local hospital construction program and on the health and medical care problems of an aging population.

Among a wide range of possible subjects, two—water pollution and air pollution—which are common to industrialized nations, were chosen to illustrate control of the environment.

Two brief statements accompanied the pictures: "As great cities grow, so do the hazards of environment. Pittsburgh, Pa., America's 'smoky city,' has cleaned up its air. Both air and water pollution are unfinished tasks for other cities in the U. S. and throughout the world." And, "Wastes from industrial plants and over-taxed disposal systems in growing suburban areas contribute to polluted rivers. Many thousands of streams and lakes provide good clean water. The job of restoring many other rivers is a big one—a task in which Ameri-

can industry, local communities, and the Federal Government are cooperating."

Three "before and after" photographs of Pittsburgh illustrated accomplishments in reducing air pollution. The environment section provided an opportunity for the guides to discuss briefly other subjects such as sanitation, personal hygiene, the safety of water and milk supplies, and the safety and quality of food and drugs.

The third building suggested the world toward which we are moving, a world in which the great diseases will have yielded to the impact of research, control measures, better care of the ill and the handicapped, and increasing control over the environment.

An important part of this section showed the pattern in which health services are provided to the people of the United States. It is a partnership of the many: the health professions, voluntary agencies, universities and research centers, hospitals and clinics, citizens groups, and local, State, and Federal Governments.

America's health objectives for the future were summed up in two brief panels. The first panel contained a quotation from President Eisenhower: "We shall not relax in the struggle against disease. The health of our people is the very essence of our vitality, our strength and our progress as a nation."

This statement on the importance of health, equally relevant to all nations, sums up the value that Americans place on this intimately human need.

On the opposite panel there was a statement of objectives which embodies both the domestic ideal and the concept of America's role in relationship to other nations:

"To continue, through research and improved public health and medical practice, the fight against suffering and premature death in America . . .

"To help pursue, through the World Health Organization and other means, the search for a healthier world."

Resistance to insecticides on the part of insects of public health importance is by no means restricted to houseflies and mosquitoes; certain cockroaches, fleas, lice, and bugs are also resistant. There are now 44 species of vectors and pestiferous insects that are resistant to one or more insecticides (1). The geographic areas involved and the number and type of insecticides to which insects have become resistant are increasing steadily.

There are 26 species of resistant insects that are vectors of diseases such as malaria, yellow fever, encephalitis, diarrhea and dysentery, typhus, filariasis, dengue, and Chagas' disease. Nine species of anopheline vectors of malaria in 7 countries, including *Anopheles quadrimaculatus* in the United States, have been found resistant to one or more of the insecticides generally used in residual spraying of homes for malaria control.

The continued effectiveness of insecticides against malaria vectors is important to our ability to cope quickly with localized outbreaks of reintroduced infection and consequent possible spread of the disease. In the fight against insectborne enteric diseases, resistance in houseflies has necessitated the development of newer and more effective insecticidal measures and greater dependence on elimination of fly breeding. The rising standard of living in the United States, particularly since World War II, has been accompanied by rapid expansion in organized mosquito control programs and other types of community insect control activities. In addition, household use of insecticides in the United States has increased tremendously during this period. It is estimated that from \$75 to \$100 million is expended annually in America for chemical control of insects of public health importance. Resistance to insecticides, therefore, is an important consideration in both the effectiveness and cost of control activities.

CDC Investigations of Resistance

The Communicable Disease Center of the Public Health Service initiated laboratory and field investigations of insect resistance when the problem was first recognized. These continuing studies, conducted by the Technical De-

velopment Laboratories in Savannah, Ga., may be grouped as (a) fundamental investigations of the biological mechanism involved; (b) detection, measurement, and evaluation of the importance of insect resistance; and (c) development of remedial measures. Throughout the period of these studies, technical assistance has been given to other Federal agencies and the States.

Resistance may be defined as the ability of an insect population to withstand a toxicant to a greater degree than a normal population and to transmit this characteristic from one generation to another (2). Three types of biological mechanisms of insect resistance are generally recognized: (a) physiological mechanisms which enable insects to withstand or detoxify insecticides within their bodies, (b) morphological mechanisms which prevent a toxicant from entering the body, and (c) behavioristic mechanisms which permit changes in the insect's behavior patterns so as to avoid exposure to lethal dosages of insecticides. Studies conducted by the Communicable Disease Center have been concerned primarily with physiological and behavioristic mechanisms.

Physiological Resistance

In the CDC laboratory investigations of the physiological mechanism of resistance, strains of various insect species, principally houseflies and mosquitoes, are selected for resistance by exposure through a number of generations to a particular insecticide. Information on the mechanism of resistance then is obtained through studies of the absorption and metabolic fate of insecticides in both resistant and susceptible strains of the insect species.

Research is continuing on the physiological mechanism of resistance of houseflies to DDT and other chlorinated hydrocarbons and to certain organic phosphorus compounds. Results of these investigations have supported the finding that the cause of resistance to DDT is the conversion of DDT to DDE, a degradation product less toxic or harmless to the insect. This conversion process is effected through the action of an enzyme, DDT-dehydrochlorinase (3).

Physiological resistance in insects other than

The increasing resistance to insecticides is threatening the impressive gains in control of vectorborne diseases. The Communicable Disease Center is studying the biological mechanisms of resistance and means of detecting and counteracting this phenomenon, and is providing technical assistance for other Federal agencies and the States.

Insect Resistance to Insecticides

R. J. HAMMERSTROM

SOME of the major achievements in public health since 1944 have been realized through the use of newer insecticides, beginning with DDT. Important vectorborne diseases, such as malaria, typhus fever, yellow fever, and insectborne enteric infections, have been controlled effectively in certain parts of the world and virtually eradicated in others through the use of insecticides. In the United States, for example, malaria is considered to be near eradication; endemic typhus fever morbidity has fallen from a peak of 5,401 reported cases in 1944 to an alltime low of about 100 cases annually. These phenomenal achievements in this country and elsewhere are attributed for the most part to the use of DDT.

The development of resistance to insecticides by many important disease vectors, however, threatens the continuation and extension of worldwide progress in the control of vectorborne diseases. For this reason, insect resistance is internationally recognized by leading

health authorities as the most important problem facing organized vectorborne disease control programs today.

Worldwide Significance

Resistance of houseflies to DDT was first noted in Italy in 1946. In immediately following years, the phenomenon was reported from other countries, including the United States in 1948. Resistance of houseflies to DDT led in subsequent years to the use of related chlorinated hydrocarbon insecticides, such as methoxychlor, TDE, lindane, chlordane, heptachlor, and dieldrin, with the result that resistance to these compounds also developed. Today, housefly resistance to DDT and to other chlorinated hydrocarbons is evident in practically all countries of the world. In some areas, including the United States, houseflies are beginning to show resistance to the more recently developed organic phosphorus compounds.

Mosquitoes began to show resistance to DDT at about the same time as houseflies. The first observations of resistance were reported for *Culex pipiens*, also in Italy. Resistance to DDT and other chlorinated hydrocarbons soon became evident in a number of species of culicine and anopheline mosquitoes in many countries. As with houseflies, certain species of mosquitoes are now resistant to some organic phosphorus compounds.

Mr. Hammerstrom, formerly deputy chief of the Technology Branch, Communicable Disease Center, Public Health Service, Atlanta, Ga., is now the regional sanitary engineer, International Cooperation Administration, Department of International Health, Lima, Peru. This paper, with minor changes, was presented at the meeting of the United States-Mexico Border Public Health Association, April 8, 1958, in Juarez, Chihuahua, Mexico.

trol, and too frequently the failure to obtain control has been attributed to resistance when other factors were responsible.

A method and a kit have been recently developed for wide-scale use in detecting the presence and extent of resistance in adult mosquitoes in malaria and other control programs. Such a method, if standardized, would also provide a valuable means of measuring in the field the susceptibility levels of various species of mosquitoes. The testing apparatus is a modification of equipment developed earlier by Fay and associates (11). In general, the test procedure entails exposing adult mosquitoes to commercially prepared paper surfaces treated with formulations of DDT or dieldrin in Rissella oil. Papers selected for use in the test kits provide surfaces of 0.25 to 4 percent DDT or 0.05 to 1.6 percent dieldrin to be used at specific exposure periods. Mortality is determined following a 24-hour holding period (12). The test procedure and kits are being evaluated in the field in the United States and in other countries.

The Technical Development Laboratories make every effort to keep up to date on the occurrence of insect resistance, especially in the United States. Instances of resistance that arise in the course of CDC's studies are investigated thoroughly. The finding of malathion resistance in a strain of houseflies in the vicinity of Savannah, Ga., in 1956 has already been described. In Bolivar County, Miss., in 1955, *A. quadrimaculatus* was found to be highly resistant to dieldrin. Followup laboratory studies indicated that this strain also was highly resistant to BHC and chlordane (13). This finding represented the first detection of resistance in *A. quadrimaculatus* to chlorinated hydrocarbon insecticides in the United States.

Information on reported or suspected insect resistance is received from State health departments, mosquito abatement districts, agricultural agencies, research institutions, and other sources in this country. These reports are studied carefully with such followup inquiries as may be necessary to ascertain whether or not the resistance actually has been confirmed on the basis of experimental data. In some instances, the Technical Development Laboratories have confirmed specimens submitted

from the field. For example, laboratory studies recently have been conducted on a colonized strain of housefly against which both malathion and Diazinon became ineffective at a dairy in Phoenix, Ariz. (10). This strain had been successfully controlled with malathion from 1954 to July 1956, at which time Diazinon was substituted for malathion because of inadequate control. Effective control again was achieved until June 1957. Topical applications of malathion, Diazinon, and parathion at CDC's laboratories indicated the strain to be resistant to all three compounds.

Technical Assistance

In addition to laboratory confirmation of suspected resistance in field operations, technical assistance is available from CDC's State Aids Section to State and local health departments and other organizations concerned in determining or confirming the presence of resistance in an insect species. In the past few years, a number of such requests from States have been met. Currently used and other available insecticides have been evaluated in field operations, and changes in control measures have been recommended.

While additional knowledge on the mechanism of resistance is being gained through research, the necessity of combating the present problem requires continuing studies for the discovery and development of new and improved insecticides and methods for their use. CDC is conducting laboratory and field tests to evaluate the insecticidal activity of experimental and available commercial compounds against both susceptible and resistant strains of arthropods. Both recognized arthropod vectors of disease and those species generally regarded as pestiferous are used in such tests. Principal attention is given to insects indigenous to the United States, but resistant strains from other countries are also tested. Such tests not only determine the most effective commercial compounds but also are used in the development of new and improved insecticidal materials.

For the control of houseflies, DDT and other chlorinated hydrocarbons are being evaluated as larvicides and also as adulticides in the form of residual deposits and space sprays. Or-

houseflies also has been investigated. For example, the enzyme system involved in the degradation of DDT by DDT-resistant body lice has received some attention. The products of the metabolized DDT, however, have not yet been identified (4).

Colonization of a dieldrin-resistant strain of *A. quadrimaculatus* is underway in the laboratory, and the mechanisms of resistance to this insecticide will be studied when the resistant laboratory colony has been established.

Consideration of the subject of physiological resistance would not be complete without some mention of genetics in relation to the acquisition of resistance. It is generally recognized that more understanding of genetics is essential to explain how a population of susceptible insects can become resistant through exposure to insecticides. Limited genetic studies by CDC have included observations on the patterns of acquisition and loss of resistance in resistant houseflies. It is apparent that more than one pattern of resistance may arise from selection of a given strain and also that the pattern of resistance loss in partially reverted strains may not parallel the pattern of resistance acquisition.

Behavioristic Resistance

While changes in insect behavior patterns are recognized as a mechanism of resistance to insecticides, there have been relatively few confirmed cases of behavioristic resistance (5). The lack of a greater number of such cases is generally attributed to the paucity of studies and observations of insect behavior prior to the use of insecticides for control of the selected species involved.

Several examples of behavioristic resistance have been found in our work. As a result of reduced flight in the presence of DDT-synergist space-spray applications, resistant flies contact less spray than susceptible flies. Studies of the resting habits of flies in rural and urban areas have suggested that following exposure to residual DDT applications these insects changed their nocturnal resting places from indoors to outdoors during the warmer periods of the year (6, 7).

In 1956, both behavioristic and physiological

resistance to malathion was demonstrated in a strain of houseflies in the Savannah, Ga., area (8). This was the initial reported occurrence of resistance to malathion by houseflies in the United States. Following 12 weeks of effective control at a dairy with a malathion bait preparation (2 percent malathion at a dosage of 4 ounces of bait per 1,000 square feet of floor area), fly populations began to increase in spite of more frequent treatment and changes in types of bait formulations. Observations revealed that the flies were no longer attracted to the malathion baits, but actually appeared to be repelled by them. The majority of the flies approached the bait in flight but failed to alight on it: a true behavioristic response. Both the behavioristic and physiological types of resistance in this strain of houseflies were confirmed in subsequent laboratory and field studies (9).

In 1957, Schoof and Kilpatrick observed a similar pattern of behavioristic resistance in the Anderson strain of houseflies collected at a chicken ranch near Savannah, Ga. (10). Laboratory tests indicated that a colonized strain of this housefly was highly resistant to malathion and less susceptible to parathion and Diazinon than a standard laboratory strain.

The ecology and biology of both resistant and normal populations of vectors are important aspects of CDC's research on resistance. Studies are conducted of breeding requirements, biting and resting habits, and changes in life cycles or biotic potentials of resistant and susceptible strains. Such information is important in detecting and understanding behavioristic resistance and for developing and applying effective control measures.

Detecting and Measuring Resistance

One of the most important problems confronting those responsible for carrying out vector control programs is the early detection and measurement of resistance to insecticide in an insect species. Evidence of resistance is observed through reduced insect mortalities following the use of insecticidal formulations and application techniques which previously provided effective control. Many factors other than resistance can influence the degree of con-

Conclusion

Insect resistance to insecticides should concern all public health workers and especially those engaged in the control of vectorborne diseases. Resistance is increasing more rapidly than research can develop ways and means of preventing or combating it. In the United States, Federal agencies, universities, and private research laboratories are conducting research on insect resistance. The Communicable Disease Center will continue its research and technical assistance activities following leads from current studies as well as any new approaches that may be indicated, and it will continue to work closely with State and local public health officials and other personnel engaged in insect control activities.

With these resources and with increased support through greater recognition and appreciation of the insect resistance problem, ways will be found to protect and advance the progress that has been achieved in the control of insects of public health importance.

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ganic phosphorus compounds are being studied as larvicides and as adulticides in the form of residual treatment and poisoned bait. One of the more significant developments in recent years has been the discovery of DDVP, which is being used widely in poisoned baits (14). Another valuable contribution has been the development of impregnated cords using organic phosphorus compounds, such as parathion and Diazinon, as residual insecticides for housefly control (15, 16). In the development of new and improved insecticidal formulations, attention is given to the combination of insecticides and to the use of synergists, additives, and attractants.

Similar research is being done on the use of various chlorinated hydrocarbon and organic phosphorus insecticides and methods of application for mosquito control. Here again, the objective is to develop improved formulations and techniques necessitated, in part, by resistance. In recent years, attention has been directed to pre-flood and post-flood treatment of irrigated areas for control of ricefield and other irrigation mosquitoes, residual larviciding against a variety of anopheline and culicine species, and fogging and barrier strip spraying for control of salt-marsh mosquitoes. In addition to laboratory and field investigations of improved insecticides and application techniques for the control of flies and mosquitoes, more limited studies of a similar nature are made on the control of cockroaches, fleas, and other insects.

The results of these investigations have been summarized as recommendations in CDC's annual report of public health pesticides, which for the past several years has been published in the March issue of *Pest Control*. This report, which also includes current data from the literature and unpublished data from other research organizations, is a valuable source of up-to-date information on the control of both resistant and susceptible insects of public health importance.

The growing problem of resistance has necessitated reemphasizing time-honored and proved methods of prevention and control of insect breeding through sanitation and other environmental measures. No insect has developed or ever will develop resistance to the elim-

ination of its breeding area. Consequently, more attention is and will continue to be devoted to improved sanitation practices for prevention of housefly breeding and to drainage, filling, diking, and improved water management practices as a permanent means of eliminating mosquito breeding. The Communicable Disease Center supports this philosophy and is directing much of its research and technical assistance activities to that end. Research is being conducted at Savannah, Ga., and at Chandler, Ariz., on composting as an effective means of refuse disposal. In many areas of the western United States, CDC's Encephalitis Section is investigating improved methods of water management as a basic approach to the prevention and control of mosquitoes associated with irrigation and other water resource developments. In the cooperative community vector control demonstration projects in which CDC is participating, emphasis is placed on permanent sanitation improvements, such as better refuse storage, collection, and disposal, elimination of privies, and improved sanitation of animal pens, as a means of effective vector control. Insecticides are used on these projects only as a supplemental measure and then with due regard to insect resistance.

While I have discussed primarily the CDC research and technical assistance activities in connection with insect resistance, I realize that the question naturally arises, What can a member of a State or local health department do? First of all, he can stimulate broader recognition among health authorities of the growing importance of this problem. He can become more familiar with and support research activity, not only in this country but on a global basis, to overcome or combat insect resistance. All can be alert to the reported or observed instances of resistance in local areas and make this information known to those who are interested, and that includes the Communicable Disease Center. For those who are engaged in operational programs, particularly the control of mosquitoes, available field tests should be employed to detect early resistance to effect both economy and adequacy of control. Finally, improved sanitation and other environmental measures can be applied.



The active sharing of experiences, knowledge, and ideas, each year enriching the partnership between the United States and Mexico for better health along the border, was continued this year at the 16th annual meeting of the United States-Mexico Border Public Health Association in El Paso, Tex., and Juárez, Chihuahua. From April 7 through 11, 1958, the discussions took stock of progress, drew patterns for future action, and reviewed pioneering techniques. Presiding over this year's meeting was Dr. Malcolm Merrill, director of the State of California Department of Public Health. The President-elect is Alberto Ortiz Irigoyen, director of Potable Water Construction in the Mexican Ministry of Hydraulic Resources. Summaries of selected papers presented at the meeting appear on the following pages.

International Health Aims Translated Into Action

As chairman of one session of the U. S.-Mexico Border Public Health Association meeting in El Paso, Dr. David E. Price, Assistant Surgeon General of the Public Health Service, commended the work of border cities in developing water and sewage facilities, work carried out with aid from the International Boundary and Water Commission and the Mexican Government's *Recursos Hidraulicos*. Specifically, he men-

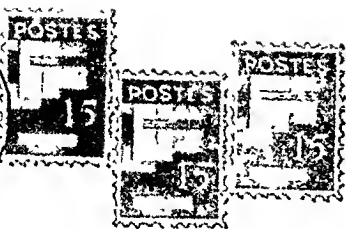
tioned sewage facilities in Douglas, Ariz., and Agua Prieta, Sonora, and in the sister cities of Nogales.

Price also paid tribute to the Mexican Ministry of Health and Welfare for its impressive malaria eradication campaign.

Among examples of contributions to border health programs made by the Pan American Sanitary Bureau, Regional Office for the Americas of the World Health Organization, Price cited the multilingual venereal disease reporting form for international exchange of information on contacts, which is now being

adapted for domestic use throughout Mexico and the United States. Together with United States Federal, State, and local health agencies, the bureau is also seeking the optimum means of reporting tuberculosis suspects found through the border X-ray program.

Turning to activities of the United States Indian health program with bearing on border health, he sketched briefly the confused citizenship and residence pattern of the Papagos, almost all of whom have relatives and therefore frequent contacts across the border. Tra-



Women's Will

During the big dry season of 1957 in La Prosperité-Bersaba, a community of 260 persons in Surinam, the usual sources of water, rain barrels and Coropina Creek, dwindled. The soil formed a hard crust. Cassava, ananas (pineapples), baeove (eating bananas), napie (a sweet potato-like root), and gember (ginger) grew poorly. There were few crops to take to market along the railroad track, a 15-minute walk from the village, or in the town of Republiek, 30 minutes away.

Mothers of La Prosperité-Bersaba, shepherding their children to Republiek's consultatiebureau, heard how other villages were working together to get wells. The women decided to do something about their own community's plight and asked for a well.

Their request surprised the Surinaans Amerikaans Bureau Technische Samenwerking, because their village had previously been unenthusiastic about the bureau's well demonstration program. Now everyone wanted to talk to the health education assistant, the public health nursing trainees, and the sanitary inspector. They even stayed home from their kostgrond (fields) to be sure they would not miss seeing these people.

At a community meeting, they selected 3 men and 2 women to visit with the sanitary inspector to see what other villages had done. They also chose one of their most dependable citizens to supervise the voluntary crew that would work on their village well.

When the train brought the materials, everyone went to work, rolling the big concrete sections of pipe over the path to the well site, and bringing sand, gravel, and cement in wheelbarrows, baskets, and pails. Digging in the parched, sun-hardened earth was exhausting, but the well grew deep enough to insure a supply of water even in the long dry season. Several nights the work went on by lantern light.

Two weeks from the day the materials were unloaded, the well was finished. On November 1, 1957, La Prosperité-Bersaba proudly dedicated its new well.

—HILDRUS A. POINDEXTER, *chief public health officer, U. S. Operations Mission, Surinam.*

Potent Water

The well in Suncheon, Cholla Namdo Province, Korea, built with materials supplied through our sanitation program, has acquired an unexpected reputation. While I was inspecting the well soon after it was completed, a woman thanked me so effusively I wondered what had brought about such profound gratitude. I learned she had had seven daughters in succession, but after drinking water from the new well had given birth to her first son, to the delight of her family and the entire community.

—WALDO E. SMITH, *sanitation adviser, U. S. Operations Mission, Korea.*

Urban Improvement

A local sanitary inspector stimulated the cleanup of one of the older sections of Santa Cruz, Bolivia. He found 200 of the 280 homes lacked a potable water supply, and the 1,745 residents had only 11 latrines, all substandard. Garbage was thrown into the streets for animals to devour or the rains to wash away.

The sanitary inspector organized a health and sanitation committee among the residents. The committee surveyed the area and, with help from the local health center, started community meetings with discussions, films, and talks.

Enthusiasm and community pride led to the construction of a public well and 221 latrines. Streets were cleaned and graded, and nearly all the families began burning or burying their garbage. The residents themselves did all the work and provided the materials, except for a handpump and its accessories.

At the public dedication of the well, citizens from nearby sections of the city were so impressed that they asked the health center to help them make similar improvements in their own neighborhoods.

—HARALD S. FREDERIKSEN, M.D., *chief, Health and Sanitation Division, U. S. Operations Mission, Bolivia.*

the disease was fifth among registered communicable diseases in 1957. He also pointed out that there were considerable numbers of recently infected as well as untreated persons and some cases with high indexes of positive serology.

The great majority of cases of venereal disease in Mexico are latent, he asserted. For that reason, serologic test laboratories and equipment have been augmented. Measures have also been taken to standardize and coordinate serologic test reports from all sources, and to make VDRL antigens available to all national laboratories. Training, briefing, and specialized instruction for the venereal disease campaign have been emphasized for personnel of medical agencies and institutions, private physicians, and community leaders, on whom the Ministry depends heavily in this drive.

As a public education device supplementing posters, pamphlets, and lectures, a film was produced in color and exhibited in leading cities. Campos Salas remarked on the growing facility in organizing public meetings for campaign purposes.

Venereal Disease Control Progress Report

In presenting the United States program in venereal disease control, Dr. William J. Brown, chief of the Venereal Disease Branch, Public Health Service, reported that in the United States the rate for syphilis has dropped from 447 to 81 per 100,000 population since 1943, the year penicillin came into use.

Although institutional care of the syphilitic insane still costs an estimated \$46 million a year, over a 10-year period first admissions of such patients have dropped from 7,000 to 2,150 annually.

In the past 6 years, an increasing number of States have been reporting more early syphilis. Reported cases of primary and secondary syphilis are 11 percent higher this year than last. Gonorrhea rates, at the same time, have shown little change. An alarming percentage of venereal disease is being found in

young people. Many infectious disease cases treated by private physicians are not being interviewed for sex contacts.

Brown reviewed the following current developments:

- Rapid plasma reagin test is revolutionizing the testing of migrant laborers. Immediate diagnosis and treatment prevents spread of infection and returns the once infected person to work without delay.

- Reiter protein complement fixation test, a specific treponemal test for diagnosticians, promises important savings in costs.

- Fluorescent antibody tests for both syphilis and gonorrhea may eventually provide rapid and inexpensive methods of detection.

- A casefinding procedure called "cluster testing" covering friends and associates of infected persons as well as sexual contacts may double the epidemiological yield.

- The training of 1,500 public health workers in 1957 by the Public Health Service is promoting more effective interviewing techniques.

- Epidemiological services to patients of private physicians have been demonstrated as a practical control measure and are being extended to many areas.

- A uniform report form for reporting venereal disease contacts and suspects in the United States has been developed, and many State health departments are considering its adoption in the interest of standardization of interstate routing of the forms.

New Mexico Aims To Stop Primary VD Infection

During the first quarter of 1958, accelerated casefinding in New Mexico was a factor in a 193 percent rise in reported syphilis and a 166 percent increase in reported gonorrhea, over the same period in 1957, according to members of the New Mexico Department of Public Health: Dr. Arthur D'Jang, director of the division of chronic disease, Dawson T. Kilcrease, health program representative in the division of venereal disease, Marion Mc-

Breen, associate bacteriologist, public health laboratory, and Dr. Stanley J. Leland, State director.

The effectiveness of the State's program, they said, is indicated by the rate of first admissions to State mental hospitals for all psychoses due to syphilis in 1955: it was 0.7 per 100,000 population, lower than the mean rate for continental United States.

Program Highlights

A confidential survey of physicians in New Mexico conducted in October 1957 revealed 640 more cases of venereal disease than were obtained from morbidity reports in the first 6 months of 1957. To stimulate reporting, the department devised a private physician's information packet with suggested treatment schedules, health education materials, evaluation of serologic reactions, and an interpretation of the new treponemal tests. Also offered was medicine for the physician's indigent patients.

Besides following up about 85 percent of the reported reactive serologic tests for syphilis and investigating 97.6 percent of reactors among braceros, the department trained several Navajo Indians and employed them as venereal disease investigators. Although Indians represent 5 percent of the people in the State, they contributed about 50 percent of the morbidity from venereal disease in 1957. In a survey including inmates of 4 prisons in the Navajo training experimental health district, a total of 2,129 serologic tests were made from June 1957 through February 1958. Navajos accounted for 96 percent of those tested. In the Navajo group, 10.1 percent were reactors, compared with 7.1 for the others.

Serologic Test Laws

Premarital serologic tests are required by a law passed in May 1957 in New Mexico, they said. Another law approved in 1949 requires all pregnant women to be tested for syphilis before delivery.

A serologic test is incorporated in a multiphasic survey among school and college students and teachers

choma, diarrhea, dysentery, the communicable diseases of childhood, and impetigo are the current challenges among these people, he said, suggesting that exploratory conversations between officials of the Division of Indian Health of the U. S. Public Health Service and their Mexican colleagues might produce improved coordination in work for such tribes.

Another activity he touched on was the study carried out jointly by the Communicable Disease Center, Public Health Service, the Mexican Ministry of Health, PASB, and border States on insectivorous bats, which on occasion infect man. A station has been set up by the Service in Las Cruces, N. Mex., to unravel the puzzling epidemiology of rabies among these bats, of which the Mexican free-tailed bat is the predominant species.

He also mentioned Communicable Disease Center studies and demonstrations in enteric disease vector control, coccidioidomycosis, and encephalitis, as well as training programs.

Price concluded with remarks on the international ramifications of research at the National Institutes of Health of the Public Health Service. There are several Mexican participants in the current program, but he wondered whether those most concerned with border health were fully utilizing grant resources. He affirmed the great interest of the Public Health Service in the border area, where, he feels, the philosophy of international health is translated into action.

Urges More Casefinding For Congenital Syphilis

Discussing the methods of finding cases of syphilis among pregnant women, Dr. Edith P. Sappington, regional medical director for the Children's Bureau, San Francisco, Calif., declared that all too many women receive no prenatal care until the second or third trimester. Moreover, though most hospitals give serologic tests for syphilis on all admissions, the cases found are either lost or fol-

lowed with difficulty because low-income mothers stay in the hospital so briefly.

She advocated wider application of a second test for pregnant women during the third trimester, at least where there is a high prevalence of syphilis, referring to the suggestion that certain patients, such as those in lower socioeconomic groups, unwed mothers, and welfare hospital patients, should have two or more tests during pregnancy.

To bolster casefinding during the infant and preschool period, Sappington suggested that hospital records of mothers of children entering child health conferences be checked for evidence of serologic tests for syphilis. Mothers delivered by midwives might be routinely tested at the conferences. Though laborious, these methods she feels are justified, since congenital syphilis has not decreased in the past 2 years.

Maternal and child health programs also could incorporate such testing into school physical examinations, she added.

Sappington also pointed to the desirability of integrated health care for all members of a family. If all went to a single physician or clinic, congenital syphilis would not easily escape detection.

Reviews Clinical Aspects Of Congenital Syphilis

During the past 12 years, the cases of congenital syphilis reported annually in the United States have fallen only by 50 percent, compared with a drop of more than 90 percent in acquired early syphilis. This was pointed out by Dr. Willie G. Simpson, assistant chief, Venereal Disease Branch, Communicable Disease Center, Public Health Service, Atlanta, Ga., who feels that the current incidence of congenital syphilis is excessive in the light of the availability of penicillin.

Simpson described the clinical aspects of congenital syphilis in considerable detail. In his comments, he mentioned:

- In the early stages of congenital syphilis, demonstrable lesions may

be absent, but they usually appear in the first 2 to 3 months of life if not already present at birth. Bone changes occur within the first 6 weeks, compared with scurvy changes after 6 months, and rachitic changes between the 8th and 18th months.

- In diagnosing asymptomatic congenital syphilis in the newborn only an increasing titer and positive serology at 3 months of age are significant. Before then, reagin found in serology tests may be from the mother. Conversely, infants with negative serology but diseased mothers should be followed up for at least 3 months. Syphilis may be suspected at birth if the serology report shows a higher titer than for the mother at the time.

- Since adults with the congenital disease will be seropositive long after treatment, retreatment should be based on definite signs of relapse.

- A higher rate of seronegativity is attained in those treated during the first year of life, than in those treated later, regardless of the amount of penicillin given above the minimum adequate dosage. The pattern of response resemble those for treatment of acquired early syphilis and during latency after 2 years of infection respectively.

- Treponemal antigen tests are valuable in cases of clinically suspected congenital syphilis with reactive or nonreactive reagin tests.

VD Control Intensified In Bracero Home Areas

In the home states of most of the braceros, the Mexican Ministry of Health and Welfare has broadened efforts to gather venereal disease data, to test prospective agricultural migrant workers serologically, and to treat those infected.

Other aspects of the Mexican Government's drive against venereal disease described by Dr. Antonio Campos Salas, chief of the Ministry's campaign against venereal diseases, have also been expanded. In spite of a general downward trend in syphilis mortality and morbidity in Mexico since 1948, he said,

and training of nursing home operators and aides.

In conclusion, he reported that many States have initiated new services for the aged and chronically ill through appropriations voted by Congress for that purpose in 1957.

About 30 percent of the population of the United States is 45 years of age or over, he noted, and 40 percent of the chronically ill are 65 years of age or more.

Isoniazid Reduces TB In Children

A year's work by the Public Health Service investigating the effect of isoniazid on 2,700 children with primary tuberculosis in the United States, Puerto Rico, Mexico, and Canada has presented physicians with a new method for control of this disease.

Dr. Edward T. Blomquist, chief of the Tuberculosis Program, Public Health Service, reported that among the children who have been taking isoniazid, the major complications of childhood tuberculosis have been practically eliminated. He advocated small daily doses of isoniazid for a year for infants who are tuberculin positive and those between 1 and 4 years old with X-ray evidence of the disease.

Another branch of the study will measure the prophylactic potential of isoniazid among older persons who, although not now exposed to tuberculosis, were infected in childhood. Evidence is accumulating, Blomquist said, that most new cases of clinical tuberculosis appear to occur among persons with subclinical infection which becomes active during stress or lowered resistance.

Care and supervision of nonhospitalized tuberculous patients must be expanded and strengthened by health departments, he feels, to meet the shift in emphasis from institutional to home care for tuberculosis patients. Health agencies, with their responsibility to protect the public from the disease, can do so by keeping active cases under care until noninfectious, with broadened clinical and nursing services, and by

keeping information on nonhospitalized patients current. Their program, he concluded, must include diagnostic, treatment, and social services, as well as public health supervision.

Home TB Care Boon To Low-Budget Lands

For countries without ample means, ambulatory home care of tuberculosis patients, instead of hospital treatment, has opened up new horizons, stated Dr. Donato G. Alarcón, chief of the campaign against tuberculosis, Ministry of Health and Welfare, Mexico.

Together with modern medication, this therapy allows such countries to undertake broad campaigns against tuberculosis without dependence upon related social and economic factors. Mexico's mortality rate from tuberculosis, he said, has dropped from 69 per 100,000 population in 1930 to 38.

Describing the antituberculosis campaign in Acapulco (population, 30,000) as a low-cost pilot project, Alarcón reviewed results of 2 years' work there: 1,025 cases of active tuberculosis were discovered; 57.3 percent of school children 6 to 12 years old were found to have positive tuberculin reactions; and during the first year of the campaign, negative concentration smears were obtained for 70 percent of tuberculosis cases.

In the opinion of Alarcón and Dr. Salvador Roquet Perez, secretary of the Ministry's campaign against tuberculosis, consistent recovery of tuberculosis patients depends more on their economic status, education, and attitude toward the disease than on hospital facilities. They attributed to social and economic factors the fact that in a previous study 65 percent of the ambulatory patients who received thoracoplasty and pneumothorax were classified as arrested and later cured. These results compared favorably with results for long-hospitalized patients elsewhere.

Although home ambulatory treatment for tuberculosis has been en-

dorsed, there is still a hospital shortage in Mexico. They concluded with details of Mexico's plans for expansion of tuberculosis hospital space in Mexico City, San Fernando, Monterrey, Tampico, and Xaltianguis.

Bovine TB Hazard Still Looms

Although tuberculosis in cattle has been reduced to 0.156 percent in the United States, dangerous foci of the infection remain. Dr. Donald Miller, veterinarian in charge, Animal Disease Eradication Division, Agricultural Research Service, U. S. Department of Agriculture, Phoenix, Ariz., stated that, during fiscal year 1957, 28.9 percent of cattle reacting to the tuberculin test showed gross lesions.

Eradication in Border States

In discussing eradication of the disease on the border, he described as essential the vigorous tracing by epidemiological means of herds of origin when infection is found post-mortem at regular kill in a packing house. For example, the recent tracing of the source of such a lesion in Texas ended in finding 40 reactors in a herd of 139.

During fiscal year 1957, Texas had 611 reactors of which 22.8 percent showed gross lesions. In New Mexico, with a consistently low level of infection, reaccreditation will be tried for 6 years instead of the usual 3. Miller explained that reaccreditation may be given when infection is under one-half of 1 percent of area cattle tested. Arizona also has low incidence, due, in his opinion, to such measures as testing all dairy and purebred cattle and 20 percent of all pastured beef cattle every 3 years.

For California, faced with non-specific reactions in certain herds and areas, Federal and State officials have developed trial testing procedures using intradermic tests with mammalian and avian tuberculin and Johnin; cervical, caudal, and ophthalmic tests; and careful epidemiological studies and complete postmortems.

and among industrial workers. During a migrant survey in 1957, a mobile unit with laboratory facilities was used, and another unit added in 1958 provided medical facilities for sparse population areas.

Three more programs were begun during 1957-58: the rapid plasma reagin test, the heated serum reagin test, and the mass Frel skin test.

In reviewing phases of the control program, D'Jang and associates drew attention to the emphasis on primary prevention of venereal diseases, through health and sex education in schools and clubs; prophylaxis instruction in defense installations; provision of recreational facilities; and suppression of prostitution. They underlined the value of facilities for early diagnosis and treatment, believing that the cooperation of the public rests not only on mass education about symptoms and modes of spread but on the availability of diagnosis and treatment facilities without respect to the infected patient's economic status.

Los Angeles District Surveyed for MCH Needs

Two maternal and child health surveys carried out in the Northeast Health District of Los Angeles, Calif., during 1956 were reported by Dr. Stella B. Soroker, district health officer, and Thelma Herold, health educator, Los Angeles City Health Department.

Health problems in Boyle and Lincoln Heights, the survey sites, resemble those on the border, they explained. These sections have more residents of Mexican origin or descent than any border city. The northeastern area, moreover, is a port of entry for Mexican arrivals.

Citing statistics depicting needs of these areas, especially with respect to infant mortality, they said that, because of extraordinary mobility of the population, newcomers are often unaware of local health resources. During 1955 one-third of the prenatal cases and one-half of the newborn received some health department supervision. The MCH

surveys sought to determine the gaps in health care for those unreached and reasons for the gaps.

Boyle Heights Survey

With volunteers from local societies, a hospital, and a junior college, the department began interviewing 500 to 600 Boyle Heights families with babies born during February through April 1955.

The interviewers found that of 232 families reached out of 662 families with children born a year before, 66 percent knew of MCH facilities and 87 percent of the mothers had received prenatal care. No protection against diphtheria, whooping cough, and tetanus was given to 22 percent of the 1-year-old population; 35 percent were not vaccinated against smallpox; and 9 percent had no health supervision. Sixty-eight percent of the families interviewed knew of services and locations of well-baby clinics.

Among reasons for not seeking protection from childhood diseases were lack of information as to the need or availability of services, indifference, and parental fear.

It was also ascertained that by 1 year of age, respiratory diseases accounted for 40 percent of conditions needing medical care, and accidents, 11 percent.

The health department recommended intensifying efforts to reach newcomers through publicity, nursing visits, and civic and religious organizations, stressing accident prevention among younger age groups, and conducting Red Cross classes for expectant parents.

Lincoln Heights Survey

In Lincoln Heights, they said, a newly formed committee of community leaders, PTA delegates, and professional persons, aided by volunteer residents, interviewed 275 families with children between 2 and 5 years old. Sampling required visiting 15 out of 100 households.

Applying the findings to the approximate total of 3,000 preschool children in the area, they estimated that 82 percent are protected against diphtheria, whooping cough, and tetanus, 71 percent against small-

pox, and 48 percent against poliomyelitis. Sixty-nine percent of the families knew about the well-baby clinics, and the reasons for not seeking protective services matched those in Boyle Heights.

Outlines Health Agency Role In Chronic Disease Battle

Advances to be made in long-term patient care, in the opinion of Dr. Wilfred D. David, chief of Program Services, Chronic Disease Program, Public Health Service, will be closely bound up with progress in public health, medical care, and in developing adequate hospital facilities.

Prevention of certain diseases, he said, is the proper direction for many programs related to chronic illness and health needs of the aged. He remarked that preventive action is now possible for more than 50 chronic diseases. Preventive programs can stop or slow a disease's progress by early detection and early therapy, and can soften the economic and social effects of the disease for patient, family, and community.

He emphasized that these programs must be started by community initiative, be part of the total community health drive, and be spurred by health agency aid.

Types of activities of the Public Health Service in support of State and local programs named were training, consultation, dissemination of information, demonstrations, and technical assistance as well as regional seminars.

David suggested the following fields for community action: diabetes casefinding with referral for diagnosis, the techniques of which have been refined; diabetes patient instruction on diet, self-administration of insulin, and personal hygiene; glaucoma screening through tonometry performed by an ophthalmologist, with referral arrangements; restorative services for patients with cerebral vascular accidents; and improvement of nursing home facilities through consultation

He estimates that, under field conditions, a 6-inch layer of compacted earth cover should prevent fly emergence.

Fly emergency traps can be used to determine the required thickness of cover and the amount of compactive effort necessary for local conditions. When the covering soil is not compacted, he said, flies can be reduced by quickly covering the refuse with a thin cover of soil to prevent more fly oviposition.

Reporting Aids Suggested In Diarrhea Seminar

Morbidity data on diarrheal disease, not officially reportable, can be gleaned from sampling surveys or from the evaluation of requests for services received by public health nurses, according to a recommendation emerging from the seminar on diarrheal diseases.

Participants stressed that in sections with a deficiency of health services, family cooperation is particularly important, even in reporting deaths. Therefore, health agencies were urged to convince families that their information will produce benefits in the form of health services. Since mortality reporting depends on competent diagnosis, it was agreed that improvement must develop locally.

Among needs mentioned to circulate and apply laboratory knowledge and resources were simplified, standardized laboratory methods and kits for shipping specimens.

Piping water into the home, as a means of reducing the sources of diarrheal disease, is usually the responsibility of agencies other than the health department. Such achievement, it was agreed, would result only from combined effort of all agencies, with encouragement from community organizations and active participation by individuals.

Though the importance of flies as vectors is recognized, fly control measures, according to the discussions, are less effective than piping water into individual homes. During peak periods of infection, suppression of flies should be encour-

aged, it was agreed, but with the realization that "flies are resistant to everything but sanitation."

Educational efforts were urged to explain the advantages of putting animal quarters in a separate building and to emphasize the ease with which food, particularly meat and fowl, can be infected during slaughtering and processing.

For treating dehydration, the principal cause of death in diarrhea victims, the prevailing opinion was that the local health agency should train suitable persons in simple methods. The chosen personnel, who must be acceptable to the families, should evaluate the adequacy of treatment facilities in the home and inform the mother of procedures to be used. The success of treatment hinges on how well the mother has been taught to recognize dehydration and on how promptly the treatment starts.

Turning to the financing and coordination of efforts by border communities, the participants advised cooperation by adjacent communities in defining joint problems, sharing observations and methods, and standardizing procedures. Communities can then either persuade higher-level agencies to take action, or they can rely on local resources. In many communities, a school teacher has been a key person in promoting the program, not only among pupils but also among families and local authorities.

Diarrhea Incidence Highest in Mexican Uplands

Mexico's highlands, in spite of their temperate or cold climate, have more diarrhea than other sectors when similar adverse environmental or social factors are present. This was one of the findings from field studies mentioned by Dr. Manuel E. Pesqueira, Deputy Minister of Health and Welfare in Mexico. Less diarrhea mortality occurs in tropical regions with abundant water and food. Attacks in these regions, though less frequent, may be more violent.

Although mortality from diarrhea in Mexico is decreasing, he emphat-

sized that the rate of 235.2 per 100,000 persons for 1952-56 is still higher than for all other communicable diseases registered during that time. To develop more exact statistics on the disease, the Ministry is contemplating setting up one or more areas of careful registry in each state.

In almost all of the Mexican states, the government has projects for water supply systems, building public baths and laundries, improving homes, installing latrines, and destroying insect-breeding grounds. In all such communities, he said, health education and maternal and child health are stressed. Mothers are taught correct baby care and feeding and are trained in home sanitation, aspects of home economics, and home care of sick children, including prevention of dehydration when diarrhea strikes.

Mexican VD Health Workers Trained in Mobile Units

In a detailed description of how a mobile unit contributes to the Mexican venereal disease campaign, Dr. Alfonso Verduzco Peñañiel, epidemiologist with the antiveneral campaign of the Mexican Ministry of Health and Welfare, related that the unit was first acquired by the Ministry in 1956 both to train personnel and to standardize control techniques throughout the country.

In addition to a laboratory for technician training and for evaluating local laboratory facilities for syphilis serodiagnosis, the unit has audiovisual units for health education and material for serologic tests, treatment, and prophylaxis.

A teacher of health sciences specializing in the program techniques and a trained contact interviewer comprise the unit's personnel, he said. After presenting the program's objectives, methods, organization, and personnel to local officials, the team begins fieldwork with public health nurses seeking such training. Among the groups tested are prostitutes, prisoners, and soldiers. The unit supplies the local laboratory with basic equipment and mate-

National Figures

Nationally, fiscal year 1957 was the third straight year with a slight infection rise, Miller said. Among 8,976,409 tuberculin-tested cattle infection appeared in 13,974. Of 14,054 reactors slaughtered, 319 carcasses, or 2.3 percent, were condemned.

Miller alluded to the lack of veterinary personnel in eradication programs. "This is no time for the veterinarians, health officials, and cattle growers to leave the field because we have a comfortable lead" he said. According to Miller, if we slacken in eradicating bovine tuberculosis, the progress of 10 years will be erased.

A Look Backward

Roughly 10 percent of tuberculosis in humans is of bovine origin, according to a study cited by Dr. Robert D. Courter, assistant chief, Veterinary Public Health Section, Communicable Disease Center, Public Health Service. But in areas with heavily infected herds the percentage is as high as 50.

About 378 million tuberculin tests have been made in cattle since the program's inception 40 years ago. Then, the program's harm to agriculture was prophesied, and the communicability of bovine tuberculosis to humans doubled. In fact, Koch, discoverer of the tubercle bacillus, was unconvinced of the need for protection against consumption of food from infected cattle.

Since antiquity, Courter related, man's attitude toward the disease has fluctuated between abhorrence and indifference. Eighteenth century laws levied drastic penalties, including exile, on those who sold meat of tuberculous cattle. Tuberculosis was then believed identical with syphilis, but when it was understood that the two diseases were not the same, aversions to such meat faded.

In the nineteenth century, he continued, when the infectious nature of tuberculosis was recognized, German veterinarians advised farmers to dispose of tuberculous animals and to cook milk before feeding

young animals, presaging pasteurization decades later.

The effects of pasteurization and the reduction in bovine tuberculosis in the United States elude easy evaluation, in Courter's opinion. A commonly used index of progress in eradicating the disease is the fall in deaths from extrapulmonary forms of tuberculosis in humans. Since the drop in mortality from the pulmonary form has paralleled that from the extrapulmonary, he feels that such an index fails to consider effects of improved social and economic conditions and control measures among humans.

Four Polio Vaccine Doses Recommended in Mexico

Based on field observations, modification of the standard dosage plan for administering poliomyelitis vaccine was suggested for use in Mexico by Dr. Carlos Calderón, Dr. Carlos Ortiz Mariotte, Dr. Adán Ornelas Hernandez, and Dr. Louis Gutierrez Villegas of the Mexican Ministry of Health and Welfare.

In a program administering Salk-type vaccine, which was carried out by the Ministry from October 1956 to December 1957 on about 221,000 children aged 6 months to 3 years, more than half of the observed poliomyelitis cases among those injected had onset from 1 to 3 months after the second dose. This led to the proposal that a dose be added from 1 to 3 months after the second, and that the reactivation dose be given 7 months later.

They found that the attack rate for those not immunized was at least 3 times higher than for children vaccinated; and among those immunized, the attack rate was higher, the fewer doses received.

Another observation was that among 150 blood specimens taken from children under 5 years old, only 10 percent of those from children having 3 doses were without antibodies. One-third from those not immunized showed antibodies, one-fourth having titrations of 1:64 or more. These results sug-

gest that the vaccine stimulates antibody formation.

The vaccine, they explained, is made in Mexico using 2 parts, instead of 1, of type 1 strain, isolated in practically all cases of acute poliomyelitis in Mexico. Instead of Salk strains, those attenuated by Sabin are used. Studies carried out on about 5,000 children in 3 districts of high prevalence in 1956 and 1957 had already indicated the children's tolerance to the vaccine as well as its effectiveness. Further studies are recommended to test vaccine made in Mexico from strains used by Salk, they said.

Study Burial of Refuse As Curb on Flies

Whether prompt burial effectively inhibits fly emergence from refuse, which during collection in warm weather already abounds in fly eggs and larvae, was the subject of studies carried out by the bureau of vector control, California State Department of Public Health.

Ralph J. Black, senior vector control specialist with the department, reported that laboratory tests during the summer of 1955 showed that fly emergence was prevented if the soil was compacted at or near the optimum moisture content, in layers varying from 1½ inches to 2¼ inches deep. Houseflies emerged through 60 inches of uncompacted earth.

Conclusions from these and subsequent field tests underlined as essential factors soil that can be compacted, adequate range of soil moisture, suitable equipment for compacting, and adequate enough thickness of cover. Generally, sand, nearly pure clay, silt, and crushed rock do not compact well enough to prevent fly emergence, he said. Field moisture content of soil is adequate if a solid clod can be formed by hand squeezing. A bulldozer was suitable for soil compaction with repeated tracking over the cover material. When applying the earth cover, tractor operators must compact side slopes as well as the top cover to prevent fly emergence.

Environmental Factors and Enteric Disease

COAL MINING communities with diversely housed population groups in eastern Kentucky were the locales of a field study to provide basic information for development of specific control measures against diarrheal diseases by determining seasonal and annual prevalence of diarrheal diseases among human populations of areas differing from one another in one or more environmental characteristics, identifying contributory factors in diarrheal disease in the different communities, and evaluating levels of sanitation in households and in the communities studied.

The study was conducted by the Communicable Disease Center of the Public Health Service with the cooperation of the Kentucky State Department of Health. During the period of study, observers determined diarrheal disease morbidity rates, *Shigella* infections in preschool children, and percentage of population infected with *Ascaris*, in 11 communities. Marked seasonal trends in reported morbidity were recorded, the highest incidence occurring during August and September. The ratio of "summer" diarrhea to "winter" diarrhea for the years 1955 and 1956 was approximately 2 to 1. Diarrheal disease prevalence increased earlier in the spring and persisted at a high level longer in the fall in areas where sanitation was least observed. Severe diarrhea was more frequently reported from the less sanitary areas.

Shigella prevalence rates obtained by rectal swabbing of preschool children ranged between 0.7 percent and 10.2 percent in individual study areas. The highest prevalence for all study populations combined occurred in the 4-year age group; in the least sanitary areas children were found to be infected at an earlier age, and the highest prevalence was in the 2-year age group. Variations in *Shigella* prevalence did not correspond to seasonal variations in reported diarrheal morbidity. Shigellosis was responsible for the majority of acute diarrheal

disease experiences observed in areas lacking sanitation, but was not a primary cause in the best sanitized area. *Salmonella* and the enteropathogenic *Escherichia coli* evidently did not contribute substantially to diarrheal disease morbidity reported in the study areas.

One of every four of the 2,798 individuals of all ages examined had stools positive for *Ascaris lumbricoides*. In the particular region



Public Health

MONOGRAPH

No. 54

The accompanying summary covers the principal findings presented in Public Health Monograph No. 54, published concurrently with this issue of Public Health Reports. The authors are with the Communicable Disease Center, Public Health Service, Atlanta, Ga., and the Hammond City Health Department, Hammond, Ind.

Readers wishing the data in full may purchase copies of the monograph from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. A limited number of free copies are available on specific request to the Public Health Service. Copies will be found also in the libraries of professional schools and at the major universities and in selected public libraries.

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Schliessmann, D. J., Atchley, F. O., Wilcomb, M. J., Jr., and Welch, S. F.: Relation of environmental factors to the occurrence of enteric diseases in areas of eastern Kentucky. Public Health Monograph No. 54 (PHSPub. No. 591). 35 pages; illustrated. U. S. Government Printing Office, Washington, D. C., 1958. Price 30 cents

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| rial for diagnosis and trains the health personnel in campaign methods. | For treatment of prostitutes, the team recommended weekly dosages of 300,000 units of penicillin pro- | caine with aluminum monostearate or 600,000 units of penicillin benzathine every 2 weeks. |
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Goals for Community Action Against Alcoholism

What should the community do about alcoholism? What would you like to see in your community 20 years from now? Here are some of the things that I think can be attained in the next 20 years, if we make use of the things we now know:

- * Citizens who recognize that some people cannot drink in moderation and that those people cannot be blamed for the conditions that made them alcoholic. In other words, an informed public.

- * Police officers who have some knowledge of alcoholism and who consider helping alcoholics part of their job as well as protecting the rights of others.

- * Courts and laws which recognize that help for the alcoholic is far more effective than is punishment.

- * Physicians who are ready, willing, and able to treat the acute phases of alcoholism and to use their skills to join with the community team that offers help for the chronic aspects of the illness.

- * General hospitals whose beds are as available to acutely intoxicated patients as they are to diabetics, and nursing staffs who recognize that there is more to alcoholism than intoxication.

- * Clergymen who are aware of the spiritual problems faced by alcoholics and their families and are ready to use their counseling skills to help rather than condemn.

- * Social agencies who offer their help to families where alcoholism has intensified normal social problems and who use their skills to help the individual alcoholic.

- * Health departments that feel as much responsibility toward alcoholism as they do any other public health problem.

- * Employers who recognize the early symptoms of alcoholism in employees, and who protect the investment they have made in these people, by getting help for them before they jeopardize their jobs.

—RALPH W. DANIEL, *executive director, Michigan State Board of Alcoholism*
(from a speech given at the Midwest Institute on Alcohol Studies, June 23–27, 1958).

Calculating Home Range and Density of Small Mammals

TWO interrelated aspects of animal population ecology are considered in this monograph. First, a mathematical formulation describes how individual animals use the space radiating from their homes. This space is designated as home range. Second, from this formulation, mathematical formulations are developed for estimating density by the use of capture data.

The probability of recording an animal per unit of area about its home or center of activity is adequately described by the bivariate normal distribution function. The farther a locality is from the center of an animal's activity, the less likelihood there is that the animal will be observed there.

In estimating density, it is customary to use some sampling device which has a discrete location in space. Obviously, some animals will live close to this device and others farther away. Where the use of space is describable by the bivariate normal distribution function, those animals living close to the sampling device will have a higher probability of being sampled than will those living farther away. With this insight into home range, it is possible to arrive at reliable estimates of density from a sequence of samples representing portions of the population removed.

Although the data in this monograph concern certain mice and other small mammals, application of the formulations presented can lead to much more precise information than is now available on the role of mammals in the epidemiology of diseases for which they serve as reservoir hosts.

The formulations concerning home range are of particular relevance in the study of animal behavior and population dynamics. They pro-

vide a basis for understanding the phenomenon of territoriality as well as a basis for measuring contact rate among members of an animal population.



Public Health

MONOGRAPH

No. 55

The accompanying summary covers the principal findings presented in Public Health Monograph No. 55, published concurrently with this issue of Public Health Reports. The senior author is with the National Institute of Mental Health, National Institutes of Health, Public Health Service, Bethesda, Md.; the junior author is with the Eastern Pennsylvania Psychiatric Institute, Philadelphia, Pa.

Readers wishing the data in full may purchase copies of the monograph from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Health Service. Copies will be found also in the libraries of professional schools and of the major universities and in selected public libraries.

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Calhoun, John B., and Casby, James U.: Calculation of home range and density of small mammals. Public Health Monograph No. 55 (PHSPub. No. 592). 24 pages. U. S. Government Printing Office, Washington, D. C., 1958. Price 25 cents.

studied, *Ascaris* infection rates were found to be at least as suitable an index of enteric disease prevalence and of environmental sanitation as *Shigella* infection rates. In the group 2 to 12 years of age, *Ascaris* infection rates ranged from 12 to 70 percent among the study populations. Rates of *Trichuris trichiura* approximated those of roundworm, although the whipworm infections, as judged by egg counts, were almost invariably much lighter. *Strongyloides stercoralis* infections were occasionally recorded and hookworm infections were rare. Prevalence of *Entamoeba histolytica* did not exceed 3.3 percent; *Giardia lamblia* and the remaining intestinal protozoa recorded prevailed at rates corresponding to ranges reported elsewhere in the United States.

Comparatively low levels of fly abundance, including houseflies, were evident in the areas under study. While it may logically be assumed that flies as mechanical vectors contributed to the reported morbidity rates and *Shigella* prevalence, the level of fly-transmitted diarrhea during the period of study was too low to be measured by the indexes available. Similar conclusions were reached with respect to studies of the role of water in enteric disease transmission. With the exception of one public supply and a very few properly constructed drilled wells, water sources in use by the study populations were subject to possible fecal contamination and may have been responsible for some cases of diarrheal disease. There were, however, no instances in which water quality could be implicated in localized outbreaks or correlated with seasonal differences in morbidity rates or *Shigella* prevalence.

Lowest rates of reported diarrheal disease, *Shigella*-positive cultures, and *Ascaris*-positive stools were recorded among study families

served by complete community sanitary facilities; markedly higher rates of all three enteric disease indexes were experienced by households served by some but not all public sanitary services; and the highest levels of the three indexes were reported from populations living where community sanitary facilities were entirely lacking. Individuals living in homes provided with inside piped water and privy excreta disposal experienced approximately twice the diarrhea, twice the *Shigella* prevalence, and four times the *Ascaris* prevalence experienced by individuals using inside piped water and flush toilets. Where water was not piped inside the house, persons having access to water on the premises experienced approximately a third less diarrhea than individuals obtaining water away from the premises. Where the water source was outside the dwelling unit, *Shigella* prevalence and *Ascaris* infection rates were comparable regardless of the location of the water source in relation to the premises.

Of several socioeconomic factors analyzed for possible influence upon enteric disease rates, only crowding, family size, and education of the mother appeared to affect rates appreciably. High person-per-room ratios, large families, and low educational levels of the mother all generally accompanied high *Ascaris* and *Shigella* prevalence. The combined effect of these factors on observed prevalence of diarrheal disease was not, however, as great as the lack of adequate sanitary facilities.

Results of these studies strongly support the premise that incidence of acute infectious diarrheal disease may be significantly reduced through selective modification of specific environmental factors within communities without regard to etiological or sociological differences.

publications

Selected Materials on Staphylococcal Disease. *PHS Publication No. 627; 1958; 237 pages; \$1.25.*

Selected reprints of articles from medical journals, information on teaching aids, list of additional readings, locations of phage typing centers, and recommendations of several professional associations are provided for instructors, physicians, nurses, and laboratory personnel.

This book may be used either as a refresher document or for orientation.

Accidental Injury Statistics. *PHS Publication (unnumbered); 1958; 61 pages.*

Salient facts about injuries and deaths from accidents in the United States are presented in a series of charts and tables prepared for health departments and agencies concerned with accident prevention.

The report is divided into sections dealing specifically with incidence of nonfatal injuries, leading causes of death, trends in accidental deaths over a 50-year period, types of accidents, relationship of accidents to marital status, and place of residence.

National Health Survey data collected in sample household interviews, figures provided by the National Office of Vital Statistics, and information contained in several selected studies of accidental injuries are included.

Statistical Summary of Sewage Works in the United States. *PHS Publication No. 609; 1958; by John R. Thoman and Kenneth H. Jenkins; 40 pages; 20 cents.*

Based on the 1957 Inventory of Municipal and Industrial Wastes Facilities, this report summarizes and analyzes data on community sewage disposal works in the United States.

Comprehensive data for all phases of sewage collection and treatment are tabulated according to States, population size groups, and major

drainage basins. Detailed analytical tables are given and comparisons are made with appropriate prior information.

This report provides the background information for use in conjunction with PHS Publication No. 610, Municipal Sewage Treatment Needs.

Indians on Federal Reservations in the United States. A digest. Billings Area. *PHS Publication No. 615, part 2; 1958; 17 pages.*

Brief information about each of the eight Federal Indian Reservations in Montana and Wyoming is contained in this digest.

The population groups, their homes, education, and income, and their health status and services are discussed. Included also is a description of the location, ownership, and topography of the reservation land.

Physicians' Handbook on Death and Birth Registration. *PHS Publication No. 593; 1958; 11th edition; 38 pages; 20 cents.*

A minor revision of a publication issued in 1949, this booklet contains facts which the practicing or prospective physician should know concerning birth, death, and fetal death registration requirements and procedures. Selected references are presented and vital statistics offices listed alphabetically by State or Territory.

Using Your Community's Health Resources. *Department of Agriculture Rural Research Leaflet No. 5; 1958.*

Steps aimed at improving use of available health services to meet rural community health problems are listed in this leaflet, prepared jointly by the Department of Agriculture and the Public Health Service. Suggestions include a study of the local situation, closer cooperation between local private and public groups, assessment of present health

facilities, and a communitywide campaign to promote better health.

Written in nontechnical language, the leaflet should be useful to public administrators, civic leaders, county agents, farm organizations, and clubs. Copies may be obtained from the Publications Office, Agricultural Marketing Service, U. S. Department of Agriculture, Washington 25, D. C.

Good Water Makes Good Neighbors. *PHS Publication No. 626; 1958; 7 pages.*

This pamphlet was designed to alert women's clubs to the urgency of the Nation's water pollution problem. It provides a brief outline of the situation, suggestions for action by women's clubs, and discussion topics.

Published Scientific Papers of the National Institutes of Health, 1957. *PHS Publication No. 618 (Public Health Bibliography Series No. 23); 114 pages.*

Papers presenting original work of scientists at the National Institutes of Health, Public Health Service, published during 1957 are listed in this bibliography. Titles are arranged by institute, division, and laboratory to which the senior author was attached when the work was done.

An author index shows the extent of multidisciplinary approach to research problems and reflects the contribution of all authors as well as each unit.

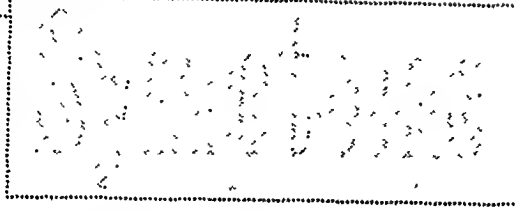
This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications other than its own.

Signs

and



of Trends in Public Health

"How To Be a Nursing Aide in a Nursing Home," a manual produced by the Public Health Service and the American Nursing Home Association, will be used by the Army as a text for inservice education in hospitals.

« »

Improvement in sanitation of food stands operated by the blind resulted from recent Public Health Service inspections in Federal buildings in Denver, Colo.

Responding to a specific request by the General Services Administration, the inspectors found that sandwiches with perishable fillings were not being properly refrigerated. Mechanically refrigerated display cases were promptly procured by the Colorado Division of Rehabilitation for the Blind. By this action, blind operators have increased the number and variety of perishable products offered for sale, with a consequent improvement in sales.

« »

A survey by the North Carolina Industrial Commission unearthed the fact that, over a 24-month period, 75 percent of the accidents happened to workers who had not eaten breakfast. The largest number of injuries occurred at 10 a. m.

« »

Portable kerosene heaters are prohibited at farm labor camps in New York State by an amendment to the State Sanitary Code. Approximately 35,000 migrants who work in more than 1,000 farm labor camps in the State each year will be affected.

Applicants for permits to operate camps will have to apply at least 30 days prior to the first day of opera-

tion, rather than 15 days as at present, according to another amendment.

Other amendments require hot and cold water at all bathing facilities of camps having a capacity of more than 25 people; heating facilities at camps occupied between October 1 and May 1; fire-resistant construction of new dwelling units housing 3 or more families or 15 or more persons; a minimum sleeping area of 40 square feet per person; and screens on all windows and exterior openings of living quarters.

Some of these changes are effective in 1959, others not until 1962.

« »

In Columbus, Ohio, the editors of the Ohio State Department of Health's monthly magazine left the beaten trail in September 1957 to produce an issue composed entirely of letters of inquiry from the public and answers to these letters by members of the health department's staff.

« »

With the aid of Hill-Burton funds, some States are allocating 36 percent of all new beds to chronic facilities, including nursing homes.

« »

Getting On—Safely, a recent 12-page publication of the National Safety Council, emphasizes special environmental aids and personal practices which can be used to prevent those types of accidents to which persons in the over-65 year age bracket are particularly susceptible.

The pamphlet is directed to the older person. A separate insert sheet, When An Elderly Person Lives With You, offers suggestions

to the younger adult who has the responsibility for the care of an elderly person.

Single sample copies are available, without charge, from the National Safety Council.

« »

Permits from the New York Department of Public Works are now required for industries that discharge industrial wastes into sewers which lead to sewage disposal or pollution control plants. Alcohols, antibiotics, arsenic, iodine, copper and copper salts, fluorine, formaldehydes, mercury, silver and silver compounds, zinc compounds, and such agents as nitrates and sulphides may be discharged into the sewer system only when diluted by other sewage to meet set standards. Eventually, fees will be charged for treatment of commercial wastes.

« »

Pamphlets entitled "Problems in Intercultural Health Programs," by George M. Foster, "Social Status and Public Health," by Ozzie G. Simmons, and "Effects of Social and Cultural Systems in Reactions to Stress," by William Candill, were published by the Social Science Research Council, New York, N. Y., during the spring of 1958.

The Committee on Preventive Medicine and Social Science Research, appointed by the council, commissioned the publication of these pamphlets. Harold F. Dorn and H. van Zile Hyde of the Public Health Service were members of the committee.

« »

Aruba, a Caribbean island, has installed a \$10 million steam distillation plant to derive fresh water from the sea. The plant extracts 2,700,000 gallons daily at a cost of about \$1.50 per 1,000 gallons. (Domestic water usually costs 10 to 25 cents per 1,000 gallons.)

« »

"Water Fluoridation: Facts Not Myths" and "Cell Examination—New Hope In Cancer," Public Affairs Pamphlets Nos. 251 and 252, have been published by the Public Affairs Committee in New York City.

1958 INDEX

Public Health Reports

Volume 73, January-December

and

Public Health Monographs

Numbers 51-55

THIS INDEX to *Public Health Reports* and Public Health Monographs is divided into a subject index and an author index.

The subject index carries one or more entries for each item published. In addition to the subject headings, categorical headings include ANNOUNCEMENTS (ORGANIZATIONS, PERSONNEL, and SCHOOLS), CONFERENCE REPORTS, DEATHS, FILMS AND FILMOGRAPHS, FRONTISPIECES, LEGAL NOTES, MONOGRAPHS, PUBLICATIONS, and TRAINING COURSES.

Public Health Monographs published concurrently with *Public Health Reports* in 1958 are listed in numerical order under the category heading MONOGRAPHS. The monograph summaries appearing in the journal are indexed under appropriate subject headings.

One asterisk before the page number indicates an original, signed article. The sign of two asterisks, used only in the author index, indicates a monograph. Entries without any symbol may refer to summaries or briefs of papers presented at conferences, narrative conference reports, statements or reports of committees, short reports without authors, or similar items.

Illustrative material on the inside of the front cover of each issue is indexed by month under the heading FRONTISPIECES. It is recommended that the covers be included in a bound volume.

An annual list of Public Health Service publications may be obtained from the Public Inquiries Branch, Office of Information.

ECHOES from Public Health Reports

TULARÆMIA Francis 1921.¹

I. THE OCCURRENCE OF TULARÆMIA IN NATURE AS A DISEASE OF MAN.

By EDWARD FRANCIS, Surgeon, United States Public Health Service.

Tularæmia is a specific infectious disease due to *Bacterium tularensis* and is transmitted from rodents to man by the bite of an infected blood-sucking insect or by the handling and dissection of infected rodents by market men² or laboratory workers.³

As observed in Utah in the months of June, July, and August, the disease is initiated by the bite of an insect, most probably the blood-sucking horsefly, *Chrysops discalis*, which previously has bitten a jack rabbit infected with *Bacterium tularensis*. Following the fly bite on some exposed surface of the body (neck, face, hands, or legs) onset is sudden, with pains and fever; the patient is prostrated, is confined to bed; the lymph glands which drain the bite become tender, inflamed, and swollen, and common quiring incision. The fever is of a septic type, lasts for six weeks, and convalescence is slow.

Probably two dozen cases occurred in Utah each of the years 1917, 1918, 1919, and 1920, but only one to have terminated fatally. The chief interest in tularæmia is its ability which accounts for its taking the form of a plague. Three months after the outbreak of tularæmia in Utah

JANUARY

VOLUME
NUMBER

CONTAINING INFORMATION ON
PREVALENCE OF DISEASE, THE
AND CONTROL OF DISEASE
RELATED SUBJECTS

UNITED STATES PUBLIC HEALTH

ISSUED WEEKLY
BY THE

PUBLIC HEALTH
REPORTS

TREASURY

JULY 29, 1921, pp. 1731-1738

Dr. Edward Francis figured prominently in identifying tularæmia as a disease of man and in delineating the method of transmission in nature.

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CORRECTIONS

MAY, p. 386, table 2 of the article entitled "Ejection and Automobile Fatalities," by Boris Tourin, the total figure for fatally injured persons expected should read 5332.

JUNE, p. 519, reference 6 of the article entitled "Mass Therapy in Attempted Control of Amebiasis in a Mental Institution," by M. M. Brooke, Ralph H. Heeren, Grace M. Sawyer, and Dorthen Stoner, the source should read Am. J. Hyg.

